MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe. Assistant Editor: Frank Owen Stetson.

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INTRODUCTION.

The Monthly Weather Review for December, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the Review, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. Garriott, in charge of Forecast Division.

During the first half of the month pressure was low over the western part of the North Atlantic, except from the 3d to the 5th, when an area of high pressure covered the eastern half of the United States and extended over Bermuda. During the latter half of the month pressure was generally high over the ocean between Bermuda and the south Atlantic coast of the United States, but low over New Foundland, Nova Scotia, and the north Atlantic coast. Over the Azores during the first half of the month the pressure was high, except from the 4th to the 8th, when an area of low pressure was apparently passing to the north of the islands. High winds were reported during this period, a velocity of 60 miles per hour from the southwest being recorded at Horta on the 6th. During the latter half of the month low pressure prevailed, the lowest barometric reading at Horta being 29.60 inches on the 28th, on which date a wind velocity of 64 miles per hour from the south was recorded. The month closed with the reestablishment of high pressure over the Azores. Over southeastern Europe pressure was generally high, except on the 10th and from the 23d to the 26th. Over the British Isles low pressure prevailed throughout the month, except on the 18th, from the 24th to 28th, and on the 31st, when pressure was relatively high. The storm of the 12th was quite severe, and high winds and gales were reported from many coast stations. The most severe storm of the month occurred at its close. On the 29th and 30th high winds and gales did considerable damage to shipping along the coasts, and to telegraph lines in all parts of the United Kingdom. This storm apparently passed on over the Baltic Sea, and shipping and property in the coast towns of Germany sustained considerable loss.

The areas of low pressure that traversed the United States during the month were more numerous and took a course somewhat more southerly than usual. With a single exception these storms presented no features of particular interest. Four storms passed up the Atlantic coast during the month causing high winds and rain and snow in the coast States. A number of schooners was driven ashore, but no very great loss was sustained. On the Pacific coast the month was unusually free from storms, four only, making their appearance on the Washington and Oregon coast. The most severe of these reached the coast on the morning of the 29th and occasioned some damage to wharfs and shipping along the Washington, Oregon, and northern California coast. On the Great Lakes navigation closed December 15, and storm warnings were discontinued for the season on that date. The two storms that occurred before that time were not remarkable. During the latter half of the month, storms were more numerous, but, with one exception, did little damage. The only remarkable storm of the month traversed the country from the 24th to the 28th and reached its maximum intensity during the 27–28th, in the Lake region. Barometric readings below 29.00 inches were recorded at several Lake stations, and considerable damage was sustained from the high winds and heavy snow that

accompanied this storm. Telegraphic communication was interrupted over a large territory for twenty-four hours, and the heavy snow delayed traffic on railroads and street car lines. A more detailed account of this storm is given on another page. Storm warnings were issued in all cases well in advance of the storm and were very generally appreciated and heeded.

Temperatures were generally below the average throughout the country during the first decade of the month, except in the upper Lake region and the upper Mississippi Valley, where they were above. During the second decade they were above normal west of the Mississippi and slightly below in the east. During the third decade temperatures were quite generally below the normal in all parts of the country. The first decided cold wave of the season made its appearance in Alberta on the morning of the 22d, and by the evening of the same date had advanced over Montana. On the morning of the 23d, it covered the Dakotas, and by night had advanced southward as far as Iowa and Nebraska and eastward over Minnesota. On the morning of the 24th the cold wave had reached Kansas, and by evening had extended over the upper Mississippi and Ohio valleys and the Lake region. On the 25th the cold wave reached the New England coast, although with diminished intensity and extent. The temperatures recorded during the passage of this cold wave were not remarkably low. The most important cold wave of the month was that which followed the storm of the 24th to 28th, and is treated in connection with that storm in another place. Ample warnings were given for both of these cold waves for all localities affected, and the favorable comments of the press showed the growing appreciation of this service. The following is from the Springfield, Ill., News of December 28, 1904.

One of the worst blizzards in many years has swept this country causing distress and damage. Life and property must be sacrificed to these storm monsters that no human ingenuity can control. The best that we can do is to send warning ahead and forewarn others of their approach. This is the work the Government has undertaken in its Weather Bureau. How much life and property has been saved by the Government's system of forewarning can not be computed. There is no branch of public service that is of such immense value to the people. This is attested by the widespread credit given it and the unanimity with which shipping, mercantile, railroad, manufacturing, and farming interests watch the weather forecasts. A twenty-four hour or even twelve hour warning of the approach of such a storm as that which swept upon us yesterday is often more than ample to protect life and property that are exposed.

Heavy frost occurred in northern Florida and along the east Gulf coast on the 13th, 16th, 18th, 19th, 20th, and 21st, and killing frost on the 29th and 30th. Heavy frost occurred as far south as Tampa, Fla., on the morning of the 21st, and killing frost on the 29th. On the latter date Jacksonville reported a minimum temperature of 30°, Tampa 34°, and Jupiter 38°. These frosts were all forecast and much loss was avoided by the timely frost warnings.

The month as a whole was unusually dry throughout the country. During the first decade light rains occurred in the Southern States and on the Washington coast and light rain and snow in the Lake region. During the second decade precipitation occurred along the Atlantic and north Pacific coasts and in the Lake region. During the third decade precipitation was more general, but still deficient in amount. The prolonged drought of the Mississippi Valley and the interior of the country was broken only by the heavy rains and snows which attended the passage of the storm of the 24th to 28th.

NEW ENGLAND FORECAST DISTRICT.

The weather was abnormally and continuously cold, the monthly mean temperature for the section, 18.3°, being 9.8° below normal and without a parallel in the twenty years of records since the establishment of the New England Section of the Climate and Crop Service. Reports from numerous observers, scattered over the district, with records dating back many years, state that a new low temperature record for December was made by the month just closed. The month was characterized by several severe storms, but those of the first part of the month were of slight importance in the northern portion of the district. Those of the latter part, however, reached all sections. Along the coast the month as a whole was considered as unusually severe and blusterous, with some storms and gales of unusual force. The most conspicuous storms were those of the 18-19th and 27-28th. During the former snow fell to an unusual depth throughout Cape Cod and well into Rhode Island and eastern Connecticut. The wind prevailed with hurricane force and there was great damage to shipping and to telegraph, telephone, and trolley wires, and much delay in railroad traffic. According to the published accounts of the damage from the storm, at least fifteen schooners were torn from their anchors and driven on shore in the Vineyard Haven Harbor. So far as reported, no vessel proved a total loss and there was no loss of life. The storm of the 27-28th was severe along the coast, and in some instances resulted in dense and persistent fog. Shipping was at a standstill and in great danger. Storm warnings were issued on fourteen days of the month and doubtless resulted in the saving of many lives and of much property. No storms passed during the month without warnings.—*J. W. Smith, District Forecaster.*

WEST GULF FORECAST DISTRICT.

Warnings of frost or freezing temperature were issued on several dates for parts of the sugar region, and while on some dates the subsequent temperatures at regular Weather Bureau stations did not verify the warnings yet temperature records in the sugar region showed 8° to 14° lower, and severe freezing. The first general cold wave of the season crossed the district from the 26th to the 28th, and timely warnings were issued. Storm warnings were issued on two dates. The warnings issued for the sugar region resulted in saving much sugar cane which otherwise would have been lost. This is shown by the following press comments which also show the popular appreciation and value of the service.

The Times-Democrat (New Orleans) of December 12, 1904, in commenting editorially on the sugar crop and freezes, says:

* * * This, however, no longer causes the terror it did of old, when the freeze descended suddenly on the planters without the slightest warning, and if it came early cut down the yield of sugar 50 or even 75 per cent. The Weather Bureau now gives the planters two or three days' notice, ample time to protect themselves against any damage by a freeze.

The Picayune (New Orleans) of December 29, 1904, in speaking of the freeze of December 28, says:

While the temperature has been below freezing in the sugar and trucking region around New Orleans several times this season, the freezing mark at New Orleans was registered for the first time yesterday morning. Timely warnings were scattered broadcast by the Weather Bureau, stating that planters and the public should prepare for temperatures of 24° to 28° in the sugar region and 30° at New Orleans. The predictions were fully verified. The Weather Bureau issued warnings for every severe change in the weather, and the few failures were when certain conditions which were expected did not materialize. Farming interests consider the warnings of incalculable value, and they do not complain if a prediction sometimes falls short. One freeze without warning means the loss of many thousands of dollars, and perhaps of millions of dollars, while the expense of occasional protection when a predicted freeze does not come is a very small matter. So accurate and definite have the warnings become, that no planting interest in this State has suffered from weather conditions if the warnings are believed and action taken to prevent loss and damage.

I. M. Cline, District Forecaster.

NORTH-CENTRAL FORECAST DISTRICT.

The temperature was higher than usual throughout the district, and there were very few special features during the month. Regular navigation having closed on December 15, this date terminated the storm-warning season. No general storm warnings were issued during the first half of the month, the weather on the Lakes continuing moderate and uneventful.

The most severe storm of the month, and possibly of the

year, crossed over the Rocky Mountain region on the 25th. It moved thence southeastward to Texas, where it was central on the morning of the 26th. Its path was thence directly northeastward over the Central States and the Lake districts, reaching Illinois by the morning of the 27th. It was accompanied by rain, turning to snow, and shifting gales, and was followed by a well-marked cold wave. Cold-wave warnings were sent out well in advance of the fall in temperature, and all sections of this district had thirty-six hours notice of the cold wave. Advisory messages were sent to all open ports on Lake Michigan that maintain winter navigation, cautioning all vessels to remain in port. In consequence no wrecks resulted. Telephone and telegraph wires suffered much damage from the storm in this district, and it was several days before the telegraphic service was again satisfactory. The snowfall was heavy in the middle and upper Mississippi valleys, which resulted in great inconvenience and delay to transportation interests.—*H. J. Cox, Professor and District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

On the morning of the 25th warnings were sent to points in Wyoming and northeastern Colorado for the cold wave that overspread the eastern slope of the Continental Divide. The following information was given transportation companies: "Cold wave to-night; temperature will reach zero or lower in Wyoming and 10°, or lower, in northeastern Colorado. High northerly winds with snow."

Apart from the low temperature that prevailed from the 26th to the 28th over the greater part of the district, the weather conditions were generally fine during the month.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month as a whole was one of deficient rainfall in California. At San Francisco hardly one-third of the normal rain fell. In the southern part of the State cloudy weather prevailed about the beginning of the month, and rain fell from a disturbance that apparently traversed the northern portion of Lower California, northwestern portion of Mexico, and the Valley of the Colorado. During this period no rain fell in northern California. A marked winter storm appeared on the northern coast on the night of December 8, and gave general rain in northern and central California. The disturbance passed rapidly eastward, as indeed did nearly all of the northern disturbances during the month. Another disturbance appeared on December 11, on the northern coast, causing, as before, rains only in the northern part of the State. An area of high pressure over the intermountain section and extending well to the west was the predominant feature of the pressure distribution during the month. A marked storm appeared off the Washington coast on December 22. By December 23 the disturbance was well marked over the northern half of the coast. On December 24 there appeared off the coast of southern Oregon and northern California a depression which subsequently traversed the entire country, causing heavy rains in northern California and high winds along the coast, in the valleys, and in the mountains. Its passage over Nevada was followed by a cold wave in that State on Christmas morning. Frost warnings were issued for California. It is also interesting to note that heavy frost was reported at Mount Tamalpais, although the wind blew from 45 to 60 miles an hour. Another storm appeared on the Washington coast on the morning of December 28, and moved slowly southward, causing rain by the end of the month as far south as San Diego.

It may be noted that in the San Francisco Bay section during the month of December an unusually large number of earthquakes occurred.—*Alexander G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

December in the North Pacific States was not so stormy as the preceding month, although several gales occurred the most severe of which was the one that swept the district on the 28th and 29th, at which time a maximum wind velocity of 76 miles from the south was recorded at North Head. Timely warnings were issued for this, as well as for all the other storms and they were undoubtedly of great benefit to shipping as the casualties reported were all of a minor character.

No cold-wave warnings were issued during the month, and the only zero weather reported lasted but an hour or two and occurred in southeastern Idaho on the morning of the 26th.—*Edward A. Beals, District Forecaster.*

RIVERS AND FLOODS.

There were no floods during the month, although the heavy rains of the last ten days of the month over the Willamette and Sacramento watersheds started a rise that gave promise of danger-line stages over their lower portions during the first few days of the succeeding month. Warnings to this effect were issued on the 30th. About the same time substantial rains over the Ohio Valley caused a general rise in the Ohio River, and navigation was resumed between the 27th and 29th. On the upper Tennessee navigation was possible at intervals.

The ice situation during the month may be summarized as follows: Red River of the North at Moorhead, Minn., increase in thickness from seven to eighteen inches. Missouri River, open throughout the month from Sioux City southward; closed at Pierre on the 12th. Mississippi River, practically closed during the latter half of the month above Davenport; at the end of the month there were twelve inches of ice at St. Paul and six inches at La Crosse. There was much heavy floating ice from below Davenport to the mouth of the Ohio River, necessitating a suspension of navigation from the 16th to the 22d, inclusive. The Ohio River was not frozen over, but there was considerable floating ice, with an occasional gorge between Portsmouth and Cincinnati.

The rivers of New England were generally frozen, the Connecticut at Hartford having closed on the 10th. The Hudson and its tributaries were also frozen, and at the close of the month there were from nine to twelve inches of ice at Albany. The Susquehanna closed earlier than usual, and the entire river above Harrisburg was frozen over by the 12th. General rains on the 27th caused a thaw and a break-up, and the ice passed down the river doing some damage. A gorge that was formed in Cecil County, Md., remained intact at the end of the month, and proved a source of serious apprehension to all who remember the great gorge of January, 1904. Warnings of the thaw and break-up were issued on the 27th, and they were the means of saving considerable property.

The highest and lowest water, mean stage, and monthly range at 257 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Division.

The following summaries relating to the general weather and crop conditions during December are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3300 and 14,000, respectively:

Alabama.—Weather generally mild and favorable for farm work. Temperature about normal; precipitation nearly normal and fairly well distributed, though more needed to put soil in good condition. Several light freezes. Cold wave during last few days slightly damaged oats in some northern counties, though oats and wheat generally promising. More oats sown, making acreage near average. Some ground broken for next year's crops. Fruit trees and strawberry plants in good condition.—*F. P. Chaffee.*

Arizona.—With temperature nearly normal and light rains generally over the Territory, the conditions were favorable for agricultural and stock interests. In the southern and central sections alfalfa and other seasonal crops made good growth until the cold days the latter part of the month checked plant development. Plowing and seeding were still in progress, except in some portions of the northern section, where scarcity of water continued. Ranges and stock were in good condition.—*H. K. Holcomb.*

Arkansas.—The temperature was nearly normal. The rainfall was deficient until the third decade, when general and heavy rains fell in all portions of the State,except the northwest portion, effectually breaking the drought that had prevailed since August. Cotton practically all picked. Too dry first of month for plowing and too cold and wet latter part. Small acreage sown to winter grains, but where sown they did fairly well. Stock healthy.—*Edward B. Richards.*

California.—Nearly normal weather conditions prevailed during the month. Severe frosts were frequent, but caused no material damage to oranges or other crops. The heavy rainfall toward the close of the month was of inestimable value to all farming interests in southern California, and other sections were also considerably benefited. Farm work had been very backward in the southern districts, but after the rains the soil was in good condition there and elsewhere and grain made good growth.—*Alexander G. McAdie.*

Colorado.—During the greater portion of the month the weather was exceptionally fine and mild, but on the 25th a cold wave with snow extended over the State, the cold weather lasting to the close of the month. With a few exceptions, the ranges over the State were in good condition; also cattle, horses, and sheep. Stock water was generally sufficient for all requirements.—*F. H. Brandenburg.*

Florida.—The month was generally favorable for farm work. Much plowing was accomplished and a good acreage was planted to oats; the early planted pushed forward, although the need of rain retarded growth somewhat. The month was colder than the average and there was a deficiency of more than an inch of rain. As a result vegetables were backward. During the latter part of the month tender vegetables suffered slightly from frosts in the central district. Ice formed over the northern and western districts.—*A. J. Mitchell.*

Georgia.—Temperature for the month was practically normal; low readings were registered from the 19th to the 22d and from the 29th to the 31st. The rainfall was slightly below normal and well distributed. All conditions were favorable to agricultural pursuits. Grain germinated a good stand and made rapid growth. Fruit trees were healthy and thrifty; many young peach trees were set out. Strawberries were in bloom in a few sections. Winter plowing progressed favorably. Stock was in good condition.—*J. B. Marbury.*

Idaho.—Weather pleasant most of the month, but became cold and stormy near its close. The minimum temperature for the State was the lowest on record for December. The range continued open later than usual, but was generally covered by the close of the month. The hay supply was good and stock was generally in good condition. Winter wheat was fairly good, though suffering in some localities from lack of snow covering. Trees were in good condition.—*Edward L. Wells.*

Illinois.—The growth of wheat was retarded by extremely dry conditions during October and November. It had little snow protection during December. Rains toward the latter part of the month were of great benefit, but the sudden change to very low temperatures on the 27th to 29th found the plant weak and small and not in good condition to withstand, unprotected, the severe cold. It was feared that some injury ensued, but it was not possible to estimate the extent.—*Wm. G. Burns.*

Indiana.—The ground was lightly covered with snow from the 10th to the 22d. The drought that had been more or less intense in all sections since the beginning of October was relieved by copious rains on the 22d-26th. When the snow disappeared, wheat, although small and mostly thin, looked green and fairly vigorous. Considerable shocked corn was still in the fields, but the greater portion of the crop had been cribbed or marketed. Stripping tobacco was in progress during the last decade.—*W. T. Blythe.*

Iowa.—With mean temperature and precipitation for the State nearly normal, December was generally favorable for the usual farm work and for feeding stock. During the first decade the weather was dry and very favorable for completing corn husking, and the crop was cribbed in excellent condition. During the coldest weather winter grain and grass were protected by snow. The blizzard on the 27th was severe on stock, but not much loss was reported.—*John R. Sage.*

Kansas.—Wheat was in fair condition in many of the southern and eastern counties, and in good condition over the greater portion of the State; but few unfavorable reports received. Corn was mostly gathered over a large part of the State; only a few counties reporting much still in the fields. Stock was in good condition, but one county making an unfavorable report.—*T. B. Jennings.*

Kentucky.—The temperature averaged somewhat below the normal, but no severe cold was experienced. The rainfall was about the normal, was fairly well distributed, and gave complete relief from the intense drought that prevailed during October and November. Winter wheat and rye improved greatly, but were still far from promising. Fruit trees were in good condition. Tobacco handling progressed well. Stock was generally in good condition.—*H. B. Hersey.*

Louisiana.—The rainfall was well distributed throughout the month and, except in a few localities, was sufficient for agricultural interests. Preparations for spring planting were well advanced in some localities but were generally backward. Freezing temperatures occurred in the sugar region on several dates. The bulk of the sugar cane crop standing was windrowed on advices contained in Weather Bureau warnings. The outlook was that a large acreage would be planted to cane this season. Seed cane generally was in good condition.—*I. M. Cline.*

Maryland and Delaware.—Inclement weather, due to storms of 5th, 10th, 17th and 27th, and steady, moderately cold weather, with normal precipitation, prevailed during the month. The temperature averaged more than 5° per day below normal. The snowfall, seventeen inches, was the greatest on record at Baltimore for December; about half fell on the 10th, and for two weeks thereafter protected and greatly benefited vegetation throughout the section. Wheat had recovered much by the end of the month, and was generally in average condition.—*Oliver L. Fassig.*

Michigan.—The cold, moderately dry weather of December was not the most desirable for winter wheat and rye, although the actual effect will not be discernible until next spring, and even then with favorable conditions may be entirely counterbalanced. The ground in the principal winter wheat counties was bare much of the month. At the close of December wheat and rye did not show any marked change since the end of November and continued fairly promising in appearance.—*C. F. Schneider.*

Minnesota.—Moderately cold periods occurred on the 12th, 13th, 27th, and 28th, with the lowest temperature for the month generally on the 28th. Warm periods occurred on the 7th, 8th, 30th, and 31st, with the highest temperature for the month on the 30th and 31st. The precipitation was practically all snow, the largest amounts falling late in the month. Farm work was about all finished before December 1.—*T. S. Outram.*

Mississippi.—The weather during the month was generally favorable, although excessive rains in the northern counties during the last week were somewhat damaging to the soil, bridges, and unpicked cotton. The gathering of crops was completed, excepting a little cotton in scattered localities. A small acreage of oats was sown in the south and some plowing was done in the east, but not much farm work was accomplished.—*W. L. Belden.*

Missouri.—The weather during the month of December, 1904, was generally favorable for winter crops. The moisture received, while not sufficient for all purposes, greatly improved the condition of wheat and rye. Ground was fairly well covered with snow during coldest spells, and at close of month wheat was in fair condition and free from insects, except in a few scattered localities. Considerable corn in shock still in the fields, weather having been rather too dry for husking. Fall sown grasses in fair condition.—*George Reeder.*

Montana.—Mild, open weather prevailed till the 21st, when general, though light, precipitation began, lasting about three days, and was followed by unseasonably cold till the 28th. Snowfall was too light to interfere materially with grazing, and practically no feeding of stock was necessary. Cattle and sheep were for the most part strong and vigorous and in condition to endure the severe weather usual later in the season. Fall sown grain failed to germinate east of the mountains because of absence of moisture, but came up and made fair growth west of the main divide.—*R. F. Young.*

Nebraska.—The dry weather and moderate temperature of the month allowed rapid progress in corn husking and nearly all of the corn was secured before the end of the month. While the soil continued dry and without a covering of snow throughout the month, little or no damage resulted to winter wheat. The mild weather was favorable for stock, which was in excellent condition in all parts of the State.—*G. A. Loveland.*

Nevada.—Temperature slightly above normal. Precipitation somewhat deficient. Weather generally fair during first and second decades;

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, DECEMBER, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	45.8	− 0.1	Pushmataha	83	26	Delmar, Madison Riverton	15	29	4.38	+0.01	Riverton	7.58	Notasulga	1.52
Arizona	45.3	− 0.1	Gila Bend	88	1,3	Fort Defiance	− 7	27	0.84	−0.13	Alpine	2.52	3 stations	0.00
Arkansas	42.9	− 0.4	Lutherville	80	2	Newport Oregon	4 4	29 28	5.10	+1.28	Elon	10.93	Fort Smith	0.55
California	47.2	+ 0.1	Ventura	88	19	Bodie	−13	26	3.04	−1.06	Monumental Mine	25.14	3 stations	0.00
Colorado	26.9	+ 1.4	Trinidad	79	23	Lay, Waldron	−33	27	0.55	−0.28	Marshall Pass	2.36	Grover	T.
Florida	58.4	− 1.0	4 stations	86	5,6	Molino	20	20	1.97	−1.15	Pensacola	6.72	Fort Pierce	0.08
Georgia	47.1	+ 0.1	Waverly	83	27	Diamond	13	30	3.59	−0.39	Columbus	6.25	Waverly	0.87
Idaho	28.1	......	Blue Lakes	60	20	Chesterfield	−35	27	1.92	....	Landore	4.72	Lost River	0.21
Illinois	29.4	− 0.6	New Burnside	68	22	Kishwaukee	−21	14	1.93	−0.36	Robinson	4.50	Springfield	0.57
Indiana	29.2	− 3.0	Topeka	70	27	Auburn	−12	14	3.48	+0.79	Bloomington	6.10	Auburn	1.17
Iowa	23.4	+ 0.5	Albia	67	22	Elkader	−19	14	1.44	+0.15	Newton	3.68	Storm Lake	0.06
Kansas	31.7	− 1.3	Gove	79	1	Macksville	− 8	15	0.64	−0.33	Columbus	1.52	Newton	0.05
Kentucky	36.4	− 0.5	Alpha Jackson	72 72	25 26	Farmers	− 2	11	4.30	+0.45	Hopkinsville	6.44	Lexington	3.10
Louisiana	51.1	− 0.3	Schriever	84	3	Baton Rouge Mansfield, Plain Dealing, Robeline.	18 18	28, 30 18	5.74	+0.96	Liberty Hill	14.09	Reserve	1.56
Maryland and Delaware.	29.6	− 5.2	Milford, Del	66	28	Oakland, Md	−11	11	3.50	+0.29	Millsboro, Del	6.19	Boettcherville, Md	1.63
Michigan	21.2	− 4.3	Charlotte	62	23	Humboldt	−26	15	1.84	−0.53	Eagle Harbor	4.57	Birmingham	0.62
Minnesota	16.7	+ 0.8	Worthington Mora	57 57	8 31	Pokegama Falls	−37	13	0.82	−0.03	Mount Iron	2.61	Mora	0.13
Mississippi	47.1	− 0.8	Crystal Springs	85	3	Ripley	14	28	5.31	+0.97	Ripley	13.70	Fayette (near)	1.91
Missouri	32.9	+ 0.3	Vichy	75	1	Unionville	−10	28	1.50	−0.67	New Madrid	4.52	Rockport	0.12
Montana	26.7	+ 2.4	Decker	77	13, 17	Culbertson	−41	27	0.85	+0.04	Saltese	3.70	Decker	0.10
Nebraska	28.3	+ 0.9	North Loup	76	31	Valentine	−20	27	0.20	−0.39	Pawnee City	0.70	Republican	0.00
Nevada	33.3	+ 2.0	Elko	76	2	Wells	−23	27	0.51	−0.45	Lewers Ranch	3.63	Caliente	0.00
New England*	18.3	− 9.8	Provincetown, Mass.	61	5	Fort Fairfield, Me	−34	25	2.46	−0.87	New Bedford, Mass.	5.27	Vanceboro, Me	0.98
New Jersey	27.0	− 6.8	Friesburg Cape May, C. H	60 60	28 31	Layton	−15	15	3.19	−0.52	Cape May	5.38	Somerville	2.06
New Mexico	35.6	0.0	Brice, Lordsburg Fort Union	78 78	1 31	Estancia	− 9	6	0.79	+0.46	Fort Wingate	2.27	Vermejo	0.08
New York	19.8	− 6.8	Ripley	60	28	Chazy	−28	25	2.55	−0.59	Palermo	6.54	Plattsburg	0.20
North Carolina	40.0	− 2.2	Southern Pines	80	27	Linville	9	20, 29	3.34	−0.48	Horse Cove	6.28	Waynesville	1.08
North Dakota	14.2	+ 1.3	New England City Oakdale	55 55	8 30	Medora	−43	26	0.62	+0.20	Wishek	2.00	Milton	T.
Ohio	28.0	− 2.9	Cambridge	69	29	Orangeville	−16	15	3.09	+0.25	Plattsburg	4.97	Orangeville	1.45
Oklahoma and Indian Territories.	39.4	− 0.5	Eldorado, Okla Ravia, Ind. Ter	76 76	1 25	5 stations	2	5 dates	0.79	−1.06	Goodwater, Ind. T	2.77	2 stations	0.20
Oregon	37.8	+ 0.9	Klamath Falls Williams	63 63	1 29	Burns	− 6	25	7.15	+0.89	Glenora	25.06	Ontario	0.70
Pennsylvania	25.8	− 5.7	Uniontown	71	27	Smethport	−19	15	2.48	−0.95	Scranton	3.71	Center Hall	1.32
Porto Rico	75.4	....	Vieques	95	6	Adjuntas	50	30	2.40	....	La Carmelita (a)	8.42	Juana Diaz	T.
South Carolina	45.5	− 1.5	Cheraw Seivern	78 78	27 24	Clemson College Walhalla	16 16	19 29	2.79	−0.45	Greenville	4.90	Charleston	1.08
South Dakota	20.7	+ 0.2	Greenwood	72	30	Ashcroft	−33	27	0.46	−0.10	Aberdeen	1.60	Leslie	0.00
Tennessee	40.5	+ 0.5	Dover	75	25	Rugby	5	29	6.07	+1.96	Memphis	10.40	Leadvale	3.00
Texas	49.4	− 0.7	Sabinal	92	1	Tulia	7	28	2.06	−0.39	Rockland	10.09	3 stations	0.00
Utah	28.8	+ 0.4	Rockville	81	2	Henefer, Morgan	−25	27	0.74	−0.18	Huntsville	2.12	Loa	0.00
Virginia	34.4	− 3.4	Callaville Cape Henry	70 70	26 28	McDowell	− 9	11	3.71	+0.69	Williamsburg	7.45	Shenandoah	1.20
Washington	36.9	+ 1.8	Southbend	70	29	Cusick	− 1	26	4.75	−0.74	Clearwater	20.92	Sunnyside	0.55
West Virginia	32.8	− 2.4	Grafton, Philippi	71	27	Weston	−20	11	3.12	+0.16	Pickens	5.91	Creston	1.63
Wisconsin	19.1	− 0.1	Whitehall	58	29	Darlington	−29	14	1.88	+0.65	Madison	3.34	Spooner	0.49
Wyoming	24.7	+ 1.9	Pine Bluff, Story	98	30	Upper Geyser Basin Border	−32 −32	26 27	0.63	−0.35	Upper Geyser Basin, Y. N. P.	2.80	3 stations	T.

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

cloudy and stormy on 23d, 24th, 30th, and 31st. The condition of winter range was generally above average; stock did well, with less feeding than usual. Considerable snow fell in the high ranges the latter part of month. Outlook good for a satisfactory water supply the coming season.—*J. H. Smith.*

New England.—The past December was the coldest of record, the next lowest mean temperature for December having been 21.1° in 1890. The cold weather was very favorable to the ice harvest which progressed to completion in many sections. The general covering of snow and ice was favorable to grass and winter grain. The water famine was somewhat relieved by the general and heavy rains of the 27th.—*J. W. Smith.*

New Jersey.—The month was the coldest since the establishment of this service, 1887. As the ground was well blanketed with snow during the entire month in the northern and central, and up to the 28th in the southern section, grain and grass were well protected from the severe freezing weather and were in very good condition. Late sown wheat in the southern section was greatly improved by the slowly melting snow. The average depth of snowfall, 19.1 inches, was the greatest on record.—*Edward W. McGann.*

New Mexico.—The month was somewhat stormy and rather cold and windy over much of the Territory. Considerable snow occurred, stock water was plentiful, the subsoil was well moistened, and outlook for later plowing, seeding, and range was very good. Stock was mostly doing well, although the range was very short in the northeast districts and shrinkage was reported from Lincoln County. Little or no loss was reported from storms and much good was expected from the heavy deposits of snow.—*Charles E. Linney.*

New York.—The month was the coldest December for a number of years and was rather dry, but winter grain and grass were well protected by snow until the 23d and were in good condition at the close of the month. Many wells and streams were dry until the drought was broken by a general rain on the 27th. The conditions were generally favorable for live stock.—*R. G. Allen.*

North Carolina.—On the whole the weather during December was not detrimental to crops. The cold period from the 11th to 16th checked growth somewhat, but the development of the roots of the winter cereals was not hindered thereby. There was a favorable covering of snow during the middle of the month. Most of the winter wheat was sown late, so that much was not up, that which was up showed a good stand. Fall oats and rye were nearly all up and looked well.—*C. F. von Herrmann.*

North Dakota.—The temperature and precipitation were slightly in excess of the normal. The snowfall was not heavy enough to interfere

with stock feeding on the open ranges, but was sufficient to satisfy thirst, and stock, as a rule, came through the month in good condition.—*B. H. Bronson.*

Ohio.—Wheat was very small and thin on the ground the first of the month, owing to dry and unfavorable weather, but was well protected by snow during the low temperatures of the middle of the month. Abundant rain fell from the 23d to 27th, and greatly improved the prospect. It was feared, however, that the sudden freezing of the ground on the 27th caused considerable damage to unprotected plants. Rye was looking well. Corn husking was not completed. Tobacco cured well and was of good quality.—*J. Warren Smith.*

Oklahoma and Indian Territories.—Moderate temperatures prevailed during the month. The precipitation was decidedly below the normal, but was fairly well distributed over the section. Wheat was greatly benefited by occasional snowfall during the month, but the general condition of the crop was poor to fair.—*C. M. Strong.*

Oregon.—East of the Cascade Mountains the rainfall was insufficient for rapid germination, and fall wheat made slow growth. Pasturage in this section was generally short, and considerable extra feeding was done. West of the Cascade Mountains the rains were heavier, and plowing and seeding were finished earlier than usual. Fall crops in this section germinated nicely, and at the end of the month they all were well rooted and presented a green and thrifty appearance.—*Edward A. Beals.*

Pennsylvania.—At the beginning of the month early sown grain ranged from fair to good, but a large acreage of late sown had germinated and developed slowly on account of prevailing drought conditions. The average snowfall (13.4 inches) was much in excess of the usual amount, and grain, meadows, and pastures were doubtless unusually well protected.—*T. F. Townsend.*

Porto Rico.—Weather generally clear to partly cloudy, with rainfall below normal; favorable for the maturing of canes. Sugar making continued throughout the month in the southern division, and the yield was generally better than at this season last year. Young canes did well; more than the usual amount was planted. Some cotton picked; yield satisfactory. Coffee picking throughout the month; yield very light. Oranges plentiful and of good quality. Some corn and beans harvested. Pasturage fair and stock in good condition.—*E. C. Thompson.*

South Carolina.—The month was colder than usual, although without any severe cold waves. The precipitation was approximately normal and was ample, as most of it was absorbed as it fell. Wheat and oat seeding was nearly completed, though retarded somewhat by frozen ground and snow in the western portions. Truck was damaged on the coast by the killing frost of the 15th. Little plowing was done for spring planting, as the soil was generally too wet. Streams continued exceptionally low, though rising slowly toward the close of the month.—*J. W. Bauer.*

South Dakota.—Except during a stormy and cold period from the 26th to 28th, the weather was very favorable for the grazing of stock on the open ranges. In some localities deficient soil moisture was unfavorable for winter rye and the limited acreage of winter wheat. Live stock and range pasturage were in very good condition and reports indicated a sufficient supply of hay and coarse feed on hand for winter. Corn husking was completed under very favorable conditions.—*S. W. Glenn.*

Tennessee.—The month was generally mild. Moderate rains fell at intervals and heavy amounts on the 26–27th. Early sown wheat at the end of the month was looking well, as a rule, and the rains during the month were beneficial in bringing up late sown grain. Winter oats were not in good condition, owing to previous drought and to poor germination.—*H. C. Bate.*

Texas.—Droughty conditions continued with increasing severity over the entire section during the first and second decades of the month, but during the third decade these conditions were fully relieved over the eastern and coast divisions and partially so over the other parts of the State, but more rain is needed in some places. The temperatures of the month were above normal until about the 25th, when a cold wave of considerable intensity caused freezing temperatures, with frost, to the coast line. All harvesting operations, except the gathering of some little cotton in a few of the western counties and the grinding of some cane in the coast district, were completed and preparatory work for a new crop was well advanced. Early sown grain made some advance but the late sown was inferior and backward, the stand being bad and growth retarded by unfavorable weather conditions. Trucking interests prospered and pasturage was unusually good and abundant, except where the drought continued.—*W. H. Alexander.*

Utah.—The precipitation during the month was below the normal and insufficient for the needs of the soil, which was very dry owing to the long drought. Temperatures were above normal, except near the close of the month, when they fell in some districts to below zero. Fall grain was generally in poor condition and in some localities the seed remained dormant owing to lack of sufficient moisture. Ranges offered no sustenance, but stock was kept in good condition by feeding.—*R. J. Hyatt.*

Virginia.—The weather for December was rather more favorable for crop progress than in either of the two preceding months. Although it was quite cold, especially during the second decade, a good snow covering obtained, and this, with ample moisture at other times, was of great benefit to clover and to the fall seeded crops of wheat, oats, rye, and barley.—*Edward A. Evans.*

Washington.—The mild weather was generally favorable for the fall sown wheat. Drought during the fall greatly delayed seeding, and also retarded germination and growth, so that the wheat was generally short, but was of good color and fairly good condition in Spokane and Whitman counties. In the central counties it germinated late, so that the crop was not vigorous. In southeast counties the prospect was below average. Owing to drought much grain failed to germinate, making reseeding necessary. No snow covering in east and southeast counties.—*G. N. Salisbury.*

West Virginia.—The weather was dry and quite cold during the greater portion of the month, and the ground was covered with snow from the 5th to the 24th. The snow was all taken off by the heavy rainfall of the 24-27th, and the warm spell at that time was followed by high winds and a freeze on the 28th. The drought then broken had continued from late summer and was undoubtedly the most severe in years. At the close of the month, wheat, rye, and oats were in very poor condition and the prospects were not favorable; stock was in fairly good condition.—*E. C. Vose.*

Wisconsin.—The feature of the month was the storm that passed over the southeastern portion of the State on the 27th, causing very heavy snow and sleet over the central counties. The heavy deposits of snow and ice broke the branches from shade and fruit trees in many localities, prostrated telegraph and telephone wires, and delayed trains. Although there were two cold periods during the month winter grains and grasses were well protected and were reported in satisfactory condition.—*W. M. Wilson.*

Wyoming.—The weather conditions for the month were very favorable. Stock remained in excellent condition, and no losses occurred. The cold wave of the 26th and 27th was not severe and was soon followed by unusually mild weather. The snowfall for the month was usually sufficient to allow stock to be kept on the winter ranges. There was a marked deficiency of snow in the mountains of the State.—*W. S. Palmer.*

SPECIAL ARTICLES.

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

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—— Ueber den Einfluss des Mondes auf die Niederschläge. Pp. 517-518.
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Hamberg, H. E. Vieljährige Temperaturmittel für Schweden. Pp. 521-523.
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Fényi, J. Meteorologische Beobachtungen in Zumbo am Zambesi, Südafrika. Pp. 524-526.
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By Mr. H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

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THE NEW "METEOROLOGIA" BY A. I. WOEIKOF.

By STANISLAV HANZLIK, Ph. D. Dated January 15, 1905.

To the series of treatises on meteorology written by scientists of different nations and culminating in Hann's Lehrbuch is now to be added this newest work by the well-known Russian authority, Professor Woeikof, of the University of St. Petersburg. This work of 719 pages, in 30 chapters, was published in four parts during the year 1904, but, unfortunately for American readers, it is in the Russian language. We give the titles of the chapters, hoping that some one will publish a complete English translation.

In the preface the author explains the reasons that led him to write a new work on meteorology, namely, that the treatise by Kaemtz, long ago translated into Russian by Professor Spassky, is to-day out of print and antiquated. The idea of translating Hann into Russian was abandoned because every meteorologist reads the German language. Still there is need of a Russian handbook for the use of those who are interested in meteorology in general, and especially for the young students, who at the beginning of their studies can not be familiar with the terms and the literature of this special subject. Woeikof has written his book for those who have only an elementary knowledge of physics and mathematics.

In the first part he explains the general scope of the science and the methods employed, Lambert's and Bessel's formulæ, graphic methods of illustration, etc. He then passes on to the laws of gases and the composition, mass, and altitude of the atmosphere.

In the chapters on radiation and actinometry he speaks of the source and the measurement of radiant heat; gives the details of the Violle-Savelieff actinometer and of the measurements made in Kief and Ekaterinburg; the distribution of energy in the spectrum and its selective absorption by aqueous vapor and by carbonic acid gas.

In chapter 6 the author enters into the largest part of his work, namely the distribution of temperature in the deep earth, the surface soil, and oceans and lakes, to all of which he devotes 151 pages. The reason for treating this subject in such elaborate detail is stated in the introduction, i. e., that so many investigations in this field have been made in Russia (see, for instance, Woeikof's reports in the Meteorologische Zeitschrift, 1903, p. 451), and also because the memoirs on this subject are scattered through different kinds of publications, and he wishes to bring them all together here.

In the chapters on the temperature of the water he includes rivers, lakes, and seas, and gives a résumé of the numerous works done since the publication of the oceanographies of Boguslawski, Krümmel, and Thoulet. He mentions here a new, large volume by Professor Spyndler.

Chapters 6, 7, and 8 give the distribution of temperature in the earth's crust, having regard, first, to the surface layer of the crust; the arrangement employed for investigation; the daily and yearly gain and loss of heat; the influence of underground waters, rainfall, foliage of plants, etc.

Chapters 9 and 10 treat of the temperatures observed in oceans, lakes, and smaller bodies, mentioning the influence of winds. He gives the yearly curve and the types of temperature distribution. The distribution of salinity, surface temperatures, and currents in the great oceans is discussed, and the influence of shape and size of the ocean bed on the direction and velocity of the current is also considered.

Chapter 11 treats of the snow, ice, and icebergs.

Chapter 12 explains the temperature and humidity of the air (Assmann's ventilated psychrometer, maximum and minimum thermometers, Saussure's hygrometer, Wilds evaporimeter), and the evaporation of sea water.

Chapters 12 and 13 deal with the thermodynamics of the atmosphere, especially as illustrated by the results of the balloon work at Berlin and the theoretical investigations of von Bezold on the successive stages in the condition of an ascending current of moist air.

Chapters 14 and 15 treat of the vertical and horizontal distribution of the average temperature and humidity and their periodic and nonperiodic changes.

Chapter 16; the cloudiness and especially the kind of clouds.

Chapter 17; rain, snow, and hail.

Chapter 18; the study of atmospheric pressure, the instruments, the changes of pressure with time, diurnal periods, isobars, the reduction to sea level.

Chapters 19 and 20; the anemometer, the velocity of the wind, the Koeppen-Espy theory as to the diurnal periodicity of the upper and lower winds, the relation between pressure and wind, barometric gradients, etc.

Chapter 21; the general circulation of the air between the poles and the equator.

Chapter 22; the influence of the continents on the winds, the monsoons, and other local winds.

Chapter 23; the optical phenomena of the atmosphere.

Chapter 24; atmospheric electricity, its measurement, with especial reference to the new theories of ions of Arrhenius, Ekholm, and others.

Chapters 25, 26, and 27 treat of cyclonic storms and chapter 28 of thunderstorms.

Chapter 29 is devoted to climate. The treatise closes with chapter 30, describing the national meteorological bureaus, forecasts, observing stations, the hours of observation, and the international meteorological congresses.

The work is richly illustrated with diagrams and pictures, such as are used by Woeikof in his lectures at the university. At the end of each chapter Woeikof adds references to the literature of the respective subjects. The whole work is well adapted to the use of students in universities.

THE RESULTS OF THE WORK DONE AT THE AERONAUTICAL OBSERVATORY AT TEGEL, NEAR BERLIN, FROM OCTOBER 1, 1901, TO DECEMBER 31, 1902.[1]

By STANISLAV HANZLIK, Ph. D.

This second official publication of the Aeronautical Observatory near Berlin relates to fifteen months of work with kites, kite balloons, free manned and free sounding balloons. This report differs from the first in that the authors have abandoned the complete reproduction of all original curves and daily weather maps, which were formerly given with the view to the possibility of the practical application of aerial exploration to the daily work of forecasting.

Many troubles occurred after the military aeronautical battalion began its full service at the end of the year 1901. This battalion is quartered across the road just opposite the observatory at Tegel, and it often happened that the wires of the kite, when flying in the air, interfered with the lines of the kite balloons of the military battalion. Therefore the plan of flying the kites from the top of the kite tower built for this purpose was abandoned and, by means of a pulley, the kite wire was led from the reel in an opposite direction along the ground away from the observatory. Another disadvantage due to proximity to the city was experienced when the kite wires broke and fell on telephone wires or on lines conducting currents of high potential, causing many disagreeable and dangerous accidents, both in Berlin and the adjacent suburbs. For these reasons it has now been decided to remove this observatory still farther from Berlin, and a new location has been chosen in Lindenberg, 60 kilometers southeast of Berlin, where it is expected that a new series of ascensions will begin in April, 1905.

As regards the kites, as indeed I had occasion to see during my stay at Tegel, all kinds have been built and tried, not only the patterns proposed by members of this observatory, but those by other meteorologists in all parts of the world, and the balloon house at Tegel is a real museum of kites exhibiting the greatest variety of shapes and sizes. The observatory employs a carpenter, whose entire time is given to building and mending the kites. A wide experience with many patterns has shown that the great Hargrave kite, with curved front surfaces devised by Mr. Clayton of Blue Hill, is the best. For light winds kites of seven square meters of surface are used, but for the strongest winds those of six, four, or three square meters are used. For the very lightest winds, a delicate kite of aluminum tubes covered with silk, devised by Assmann, has been successfully flown. Recently the X kites devised by the assistant of the observatory, Mr. Mund, have been used. They are of the Hargrave pattern, but easily fold up flat for convenience of transportation, and are used therefore as auxiliary for holding up the kite line. The advantage of folding up is apparent when the kites in high winds tear away or are automatically released and carried far away.

As regards kite balloons, it is found that when they are frequently used the balloon fabric becomes useless within a half year, making them very expensive when we recall that a kite balloon of 68 cubic meters capacity costs 1300 marks.

As regards the self-registering instruments, Professor Marvin's kite meteorograph proved to be a satisfactory working instrument up to the height of 2500 meters for which it was designed; but a considerable correction must be applied if one wishes to use it at higher elevations. In fact, the first great height attained at Tegel, December 6, 1902, as computed from the original barograph curves, gave 5475 meters, but a subsequent very careful investigation reduced this height to 4820 meters. The sharpness of the curves given by the Marvin meteorograph is injured by the oscillations of the kite, unavoidable in strong winds, but the curves were much improved by an arrangement devised by Doctor Elias, who fastened the meteorograph by springs to the front cell of the kite, thus shielding it from shocks and vibrations. Marvin's electrically-registering anemograph worked with much uncertainty and often entirely stopped. Moreover, being exposed on top of the kites, it was often injured and the friction coefficient changed thereby. For this reason some columns given in the present volume are left entirely blank as to the wind velocity. As an improvement, Professor Assmann has applied the Woltmann vanes (like the vanes of an electric fan). The

[1] Ergebnisse der Arbeiten am Aeronautischen Observatorium, October 1, 1891, bis December 31, 1902, von R. Assmann u. A. Berson.

framework carrying these small vanes is attached to the front of the opening of the Marvin meteorograph. The vanes are calibrated by comparison with an anemometer, and must be recalibrated from time to time.

For use with his expansible India rubber sounding balloons, or Platz balloons, Assmann invented a very light meteorograph. To this end he adopted an endless roll of gelatinized Japanese silk paper. This endless roll passes over two small aluminum rollers, of which the upper one is moved step by step by the aneroids, which act on ratchets attached to either end of the upper roller, while a weight on the lower roller keeps the sheet stretched smooth. The thermometer is a metallic one, consisting of two circular plates of metal, copper and invar (Guillaume's nickelsteel), soldered together. The motion of the free end of this compound ring is magnified by levers, which eventually move a delicate silk thread running over a wheel so that its recording pen marks the temperature curve on the sheet of silk at right angles to the direction of its motion. This pen describes a nearly closed curve from the beginning to the end of any ascension, which curve is a function of the pressure and temperature. The thermograph and the hair hygrometer are inclosed in a vertical polished aluminum tube, which protects them from direct solar radiation. When the balloon falls to a pressure of about 600 millimeters, the pens are mechanically lifted and their record ceases. This arrangement has the advantage that we may thus clearly discriminate between the ascending and the descending curves; it also preserves the whole record from injury or other damage when the kite falls to the ground, especially if the instrument remains a long time in the open air and is tossed about by the winds. In order to know whether the balloon actually bursts or how long it floats at a high level, exposed to the sunshine, there is added a clock, which also makes a record on the same sheet. This new form of meteorograph is inclosed in a box of magnalium; it weighs 620 grams and can be furnished for 360 marks by R. Fuess, Steglitz.

In order to measure the angular altitude of a kite carrying a meteorograph a special apparatus was used; a Steinheil astronomical telescope with a large field of view and a pair of cross wires in the center was furnished with horizontal and altitude circles reading to 0.1°; a self-recording apparatus was contrived so that this really constituted a "goniograph." The observer has only to keep the cross wire pointed on the balloon or kite as closely as possible, and the apparent altitude and azimuth are simultaneously recorded on two sheets of paper from time to time. At the new observatory at Lindenberg it is proposed to keep two of these goniographs at work, at the ends of a short base line, in order to calculate the location of kite or balloon at any moment.

The work at Tegel is to be considered as preliminary to future work. Four hundred and seventy-five ascensions were made, of which 356 occurred during the fifteen months whose results are published in the present volume. They may be classified as follows:

(A) Fifteen ascensions of manned balloons; of these the longest voyage was 1470 kilometers in twenty-nine hours to the government of Poltava, in southern Russia, by Professor Berson and Doctor Elias; the highest ascent was 7832 meters.

(B) Twenty-two ascensions of free sounding balloons of the Assmann type, one of which was lost. The average altitude attained by 21 of these was 9816 meters. The average of the 17 highest was 11,157 meters, 3 rose above 19,000 and the maximum was 19,960 meters.

(C) Two hundred and five kite-balloon flights and (D) 103 kite flights. The excess in the number of flights of kite balloons was due largely to the fact that Doctor Elias was engaged in his study of the formation of fogs and also to the fact that at first there was no great familiarity with the management of kite ascents; but all this was changed in August, 1902, when Professor Assmann ventured to start with daily flights in any kind of weather, and the use of kite balloons was then reduced to a minimum. Under these conditions very often a kite ascent was accomplished when at first sight it seemed impossible on account of the feeble winds near the surface. In such cases by unrolling several hundred meters of wire, laying it out in the direction of the feeble wind, attaching the kite and reeling in with great speed, they produced an "artificial" wind, which increased the actual wind so that the kites were thrown up into a stratum of air of greater velocity. But very often the trees around the observatory prevented such experiments. In a similar way when much line had been played out and the kites, owing to the feeble upper wind, did not rise high, they were forced to rise higher by reeling in rapidly. Frequently when the kite was caught in the top branches of a tree it was necessary for an archer to shoot a light arrow carrying a light line over the tree; by this line a stronger one was drawn up and over, so that one could climb up to the kite and rescue it, or at other times the balloon was used to lift the kites from the trees.

As regards the personnel of the observatory it may be said to consist of the director, Professor Assmann, the permanent assistants, Professor Berson and Doctor Elias; and clerical work is done by Messrs. Dintner, Brehm, Koercke, and Koblenz.

The most expert mechanician, Thieme, was continually engaged in building and repairing the meteorological and other instruments, while R. Schmidt and W. Mund usually assisted during the kite flying, and F. Schmidt acted as balloon inspector. A carpenter was also continually employed, as mentioned above, in building and mending the kites.

The observatory at Tegel constituted a division of the Central Meteorological Office. But it is understood that the new establishment at Lindenberg will be an entirely separate institution for aerial research under Professor Assmann.

Appended to the record of kites and balloons is a paper on the formation of fogs by Doctor Elias that was translated in part by Mr. Proctor for the MONTHLY WEATHER REVIEW for September, 1904.

A second appendix by Berson and Elias gives the results of kite flying over the Baltic Sea, the North Sea, and Norwegian waters. These flights were made during their vacation excursion to Spitzbergen on the steamer *Oihonna*. On this occasion all the instruments and kites were supplied by the Tegel Observatory in order to practically test the well-known idea of Mr. Rotch as to the possibility of flying kites on the open sea from ships. Mr. Dines and Teisserenc de Bort had also done some work in this line following the idea of Mr. Rotch, and quite recently the Prince of Monaco has done so near the the Azores, according to the report of Professor Hergesell to the International Aeronautical Congress held last year, 1904, in St. Petersburg. On the Bodensee, in Switzerland, Hergesell and Zeppelin have also used a steamboat with success. Ascensions were made by Berson and Elias nearly every day from August 3 to 29 from the steamer *Oihonna*, and the results are given in full, showing in general that this method can be applied everywhere.

EVAPORATION OBSERVATIONS IN THE UNITED STATES.

By HERBERT HARVEY KIMBALL, Librarian, U. S. Weather Bureau.

[Read before the Twelfth National Irrigation Congress at El Paso, Tex., November 16-18, 1904.]

It is important that irrigation engineers should know not only the rainfall, but also the evaporation over any given region. Unfortunately, the measurement of evaporation presents many more difficulties than the measurement of precipitation. In fact, the rate of evaporation from land surfaces depends upon so many different elements that it can be treated only in the most general manner. Thus, it has been shown that the

evaporation from saturated soil covered with growing plants is greater than from a water surface, but becomes less when the level of complete saturation falls a few inches below the soil surface, and continually diminishes as this level recedes to increasing depths. Also, the evaporation from a forest of evergreen trees is greater than from a forest of leafy trees; from the latter it is greater than from grass, from which in turn it is greater than from bare soil. The composition of the soil has its effect upon the rate of evaporation, and so also has the state of cultivation. Furthermore, the rate of evaporation from any surface has been found to vary with its temperature, with the quantity of moisture in the air, and with the wind velocity.

Even if we were able to determine the exact relation between each of these elements and evaporation, we see at once how hopeless it would be to undertake to compute accurately the evaporation over any very extended region of land surface. It is therefore customary to deduct the run-off from the rainfall over a watershed, and to attribute the difference to evaporation. This has been done by Mr. George W. Rafter in "Water Supply and Irrigation Papers No. 80, U. S. Geological Survey," for twelve drainage basins in the eastern part of the United States, as follows:

Drainage basins.	Years of record.	Rainfall.	Run-off.	Evaporation.
		Feet.	*Feet.*	*Feet.*
1. Muskingum River, Ohio	1888–1895	39.7	13.1	26.6
2. Genesee River, N. Y	1890–1898	40.3	14.2	26.1
3. Croton River, N. Y	1877–1899	49.4	22.8	26.6
4. Lake Cochituate, Mass.	1863–1900	47.1	20.3	26.8
5. Sunbury River, Mass	1875–1900	46.1	22.6	23.5
6. Mystic Lake, Mass	1878–1895	44.1	20.0	24.1
7. Neshaminy Creek, Pa	1884–1899	47.6	23.1	24.5
8. Perkiomen Creek, Pa	1884–1899	48.0	23.6	24.4
9. Tohickon Creek, Pa	1884–1898	50.1	28.4	21.7
10. Hudson River, N. Y	1888–1901	44.2	23.3	20.9
11. Pequannock River, Conn	1891–1899	46.8	26.8	20.0
12. Connecticut River, Conn.	1872–1885	43.0	22.0	21.0

The rainfall and run-off have been computed for many other watersheds in the United States, particularly in California, where the run-off is a much smaller percentage of the rainfall than in the Eastern States.

As a practical problem in irrigation, however, the evaporation from water surfaces is of much more importance than the evaporation from land surfaces. The engineer will naturally determine his water supply, not from the annual precipitation, but from the run-off of available streams. Having ascertained this, the question of losses becomes important, and if storage basins are of considerable area the loss by evaporation in a dry climate becomes very serious, having been estimated, in some cases, to be as much as 30 to 50 per cent of the amount stored.

Fortunately, the determination of the evaporation from a water surface presents fewer difficulties than the evaporation from land surfaces. Generally speaking, the determination may be made by two quite different methods; (1) by direct measurements from properly exposed water surfaces, and (2) by computations based upon the temperature of the water surface and the value of certain meteorological elements. With proper attention to exposure, direct measurements of evaporation from water surfaces should give the more reliable results. Unfortunately, proper exposure is not always practicable, and it is therefore necessary to consider the character of the exposure in connection with each series of evaporation experiments, and in some cases to apply a correction before the results will fairly represent the evaporation from a reservoir or a lake.

One of the most exhaustive series of evaporation experiments in the United States was conducted by Mr. Desmond Fitzgerald,[1] between the years 1876 and 1886, in connection with the reservoirs of the Boston waterworks. He not only measured the evaporation directly by means of tanks floating on the surface of reservoirs, some of them arranged to record automatically the rate of evaporation, but he also conducted elaborate experiments to determine the relation between the rate of evaporation and the temperature of the water surface, the temperature of the air, the amount of moisture in the air, and the movement of the air.

He found that the rate of evaporation depended upon three elements; the vapor pressure corresponding to the temperature of the surface of the water, the vapor pressure corresponding to the dew-point of the atmosphere, and the velocity of the wind.

Representing by E the evaporation in inches per hour from a water surface, by e_s the vapor pressure in inches corresponding to the surface temperature of the water, by e_d the vapor pressure corresponding to the dew-point of the atmosphere, and by v the wind velocity in miles per hour, he obtained:

$$E = 0.0166\ (e_s - e_d) \left(1 + \frac{v}{2}\right)$$

as the equation for the hourly rate of evaporation. This equation he found to hold good for an ice surface as well as for a water surface, in the shade as well as in the sunshine, and by night as well as by day.

Measurements of evaporation from the water in a tank three feet cube, the top flush with the surface of the ground, have been made since 1887 at Fort Collins, Colo.,[2] under the direction of Prof. L. G. Carpenter. The temperature of the water in the tank was found to be lower than the temperature of the water in reservoirs and lakes in the vicinity, and in consequence the evaporation was less. Fitzgerald[3] notes a like deficiency in temperature and evaporation in connection with tanks set in the ground near Croton Reservoir, N. Y., but at Lakeport and Kingsbury Bridge, Cal., the temperature and the evaporation, as measured in a tank set in the ground, were found to exceed like measurements in tanks floating in lakes. Since a great many measurements of evaporation have been made from tanks set in the ground, it is important that these discrepancies in water temperature and evaporation be borne in mind.

From his investigations in 1889 Professor Carpenter found that the daily evaporation could be very accurately expressed by the equation:

$$E = 0.3868\ (e_s - e_d)\ (1 + 0.0025\ W),$$

where W represents the wind movement in twenty-four hours, the other symbols having the same significance as in Fitzgerald's equation. Reduced to a like period (twenty-four hours), the latter becomes:

$$E = 0.3984\ (e_s - e_d)\ (1 + 0.0208\ W).$$

The agreement between the two is quite remarkable when we consider the difference in the climatic conditions at the two stations. The difference in the values of the coefficient of W was attributed by Professor Carpenter to the fact that Fitzgerald measured the wind velocity at the surface of the water, while Carpenter's wind velocities were obtained from an anemometer on the roof of the college building.

Subsequent observations served to confirm the accuracy of Carpenter's formula, and after ten years, by means of comparative readings between his standard tank and tanks floated on water surfaces, he computed the average annual evaporation from a free water surface at Fort Collins to be 59.5 inches instead of 46.3 inches, as he had measured it.

In 1887 and 1888 Prof. T. Russell,[4] of the U. S. Signal Service, investigated the rate of evaporation in standard ther-

[1] Transactions of the American Society of Civil Engineers, vol 15, p.581.

[2] See Annual Reports of the Agricultural Experiment Station, Fort Collins, Colo.

[3] Proceedings of the American Society of Civil Engineers, vol. 15, p. 617.

[4] Monthly Weather Review, 1888, p. 235.

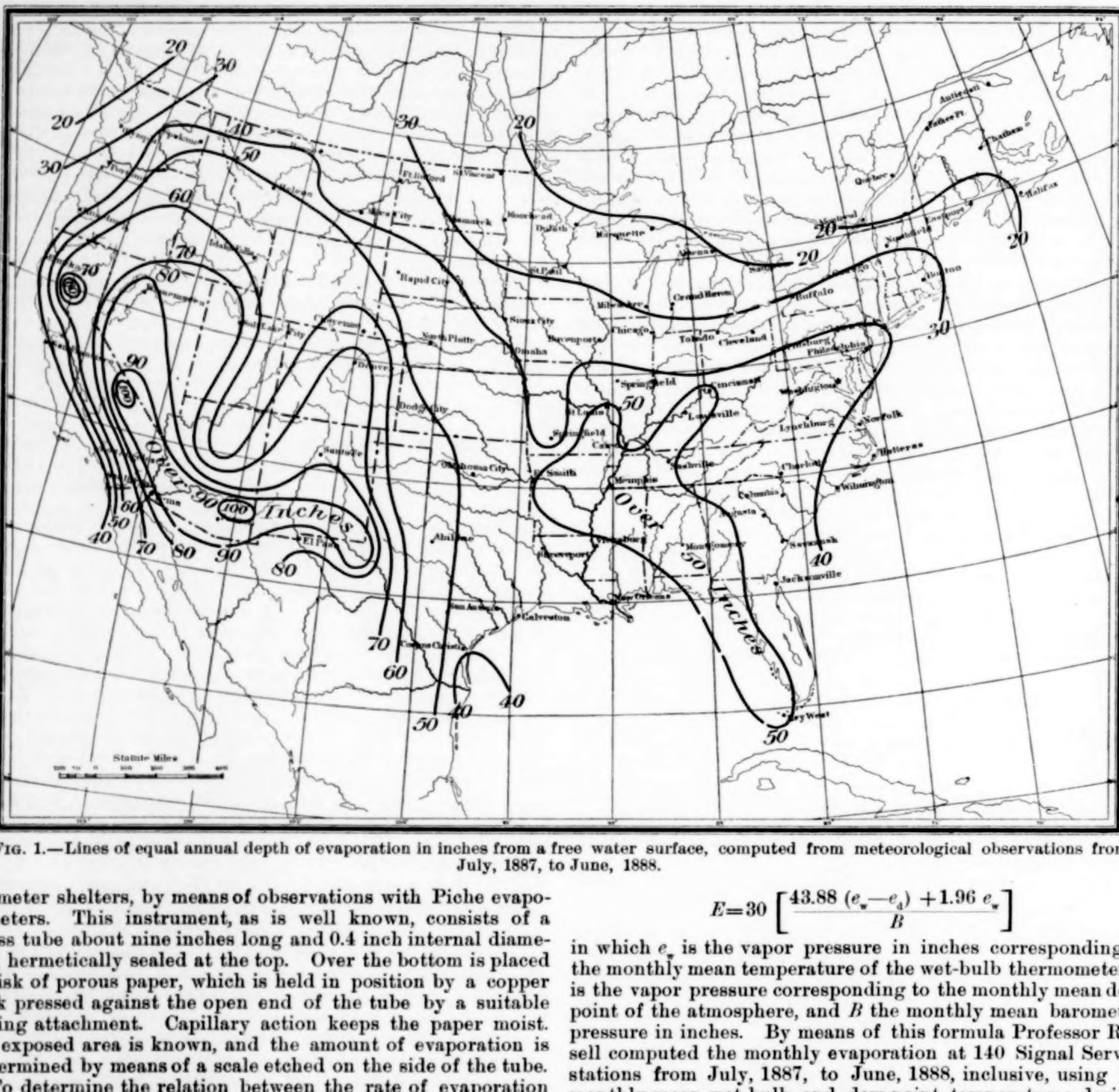

FIG. 1.—Lines of equal annual depth of evaporation in inches from a free water surface, computed from meteorological observations from July, 1887, to June, 1888.

mometer shelters, by means of observations with Piche evaporimeters. This instrument, as is well known, consists of a glass tube about nine inches long and 0.4 inch internal diameter, hermetically sealed at the top. Over the bottom is placed a disk of porous paper, which is held in position by a copper disk pressed against the open end of the tube by a suitable spring attachment. Capillary action keeps the paper moist. Its exposed area is known, and the amount of evaporation is determined by means of a scale etched on the side of the tube.

To determine the relation between the rate of evaporation from a Piche evaporimeter and a water surface Professor Russell exposed two of the Piche instruments in a closed room in which were two open tin dishes filled with water. Both the Piche evaporimeters and the dishes were weighed at frequent intervals, and it was found that the Piche instruments evaporated 1.33 times as fast as the open dishes. Eighteen Piche instruments were then exposed at various Signal Service stations, from May 31 to September 30, 1888, and the observed quanity of evaporation was divided by 1.33 to reduce it to the evaporation from a water surface. By the method of least squares, the relation between the rate of evaporation, the temperature of the evaporating surface, and the amount of moisture in the air was determined from observations made during the month of June. The temperature of the evaporating surface in this case was the same as that of the wet-bulb thermometer. The monthly rate of evaporation was found to be quite accurately expressed by the equation:

$$E=30\left[\frac{43.88\,(e_w-e_d)+1.96\,e_w}{B}\right]$$

in which e_w is the vapor pressure in inches corresponding to the monthly mean temperature of the wet-bulb thermometer, e_d is the vapor pressure corresponding to the monthly mean dew-point of the atmosphere, and B the monthly mean barometric pressure in inches. By means of this formula Professor Russell computed the monthly evaporation at 140 Signal Service stations from July, 1887, to June, 1888, inclusive, using the monthly mean wet-bulb and dew-point temperatures derived from tridaily observations. From the data thus computed, the accompanying chart showing "Lines of equal annual depth of evaporation in inches from a free water surface" was prepared. Professor Russell states his belief that this chart represents approximately the evaporation that takes place from the surfaces of ponds, rivers, reservoirs, and lakes in the vicinity of Signal Service stations, basing his belief principally upon the results of evaporation experiments conducted under the direction of the Central Physical Observatory at St. Petersburg, from May to October, 1875, and discussed by Ed. Stelling in Band VIII, No. 3, of Wild's Repertorium für Meteorologie, 1882. Stelling's equation, however, is:

$$E=A\,(e_s-e_d)\,(1-Bv)$$

which is identical in form with Fitzgerald's, the symbols having the same significance. His constants, E, A, and B, which are computed for the centigrade system, were found to

vary with the seasons, and are therefore not easily comparable with Fitzgerald's.

Russell's formula, however, departs radically from those of Fitzgerald, Carpenter, and Stelling, in that it substitutes the vapor pressure corresponding to the temperature of the wet-bulb thermometer for the vapor pressure corresponding to the temperature of the surface of the water, and adds a term depending upon this same vapor pressure, e_w, in place of the wind velocity term. This latter is dropped, and the equation represents the evaporation with a wind velocity outside the shelter of 7.1 miles per hour, which was the average at the stations where the Piche observations were being made, during June, 1887.

It is evident that this wind velocity will not apply to all parts of the United States for all seasons of the year. Neither will it do to substitute the temperature of the wet-bulb thermometer for the temperature of the water surface, the former being cooler than the latter. No doubt the additive term containing e_w compensates for this in a measure, but we must conclude that Russell's formula does not rest upon as sound a physical basis as do the formulas of Stelling, Fitzgerald, and Carpenter. The term $\frac{1}{B}$ was introduced on account of the wide variations in the value of B at the different stations. It is unimportant when discussing the observations at a single station.

Upon the organization of the Irrigation Survey by the U. S. Geological Survey in 1888, arrangements were made for measuring the evaporation at several points in the arid regions of the United States. It was recognized that the rate of evaporation depended upon the dryness of the air, the temperature of the water surface, and the velocity of the wind at the water surface. An effort was therefore made to measure the evaporation from a water surface having the same temperature as the surface of lakes or reservoirs, and exposed to the same wind velocity. To accomplish this galvanized-iron evaporating pans, three feet square and eighteen inches deep, were floated on the surface of the body of water from which the evaporation was to be measured. The pans were kept nearly full, with the surface of the water in them about on a level with the water outside. The evaporation was at first measured by some sort of gage, but later was determined from the amount of water that was added to bring the surface to the top of a pin projecting from the center of the pan. A record of the water temperature inside and outside the pans was kept. Usually a difference was noted, the inside temperature being higher in the daytime and lower at night. The average is, however, about the same in each. It is not probable that the water in pans is exposed to quite so high a wind velocity as the average over outside surfaces, but to offset this the water in the pan wets the sides, and this increases the evaporating surface. It is therefore assumed that in general the evaporation from a floating pan of this type when kept nearly full represents the evaporation from the outside water surface very closely.

Several of the agricultural experiment stations measure the evaporation from pans, but most of the pans are set in the ground; and for reasons already given their indications are not believed to represent the evaporation from reservoirs and lakes as closely as do those from floating pans.

For the purpose of checking Russell's computed values, the following table has been prepared. In the first two columns are the names of stations and the evaporation computed by Russell. In the following columns are the names of neighboring stations at which measurements of evaporation from water surfaces have been made, the amount of evaporation measured, and the character of the exposure. We are thus enabled to judge of the probable value of Russell's chart.

Annual evaporation.

Russell's formula.		Surface measurements.		
Stations.	Evaporation.	Stations.	Evaporation.	Exposure.
	Inches.		*Inches.*	
Boston, Mass	34.4	Boston, Mass	34.78	Beacon Hill Reservoir.
New York, N. Y	40.6	Boston, Mass.	39.11	Chestnut Hill Reservoir, floating pan.
Cheyenne, Wyo	76.5	New York, N. Y	39.64	Croton Reservoir, floating pan
		Laramie, Wyo	46.30	Ground.
		Fort Collins, Colo	46.16	Ground.
El Paso, Tex	82.0	Fort Collins, Colo	59.50	Computed for reservoir.
		Fort Bliss, Tex	82.65	Floating pan.
Salt Lake City, Utah.	74.4	Fort Douglas, Utah	42.46	Floating pan.
Fort Grant, Ariz	101.2	Tucson, Ariz	75.78	
Prescott, Ariz	56.0	Tempe, Ariz	65.00	Floating pan.
Sacramento, Cal	54.3	Clear Lake, Cal	32.38	Floating pan.
		Clear Lake, Cal	33.40	Ground.
Fresno, Cal	65.8	Kingsbury Bridge, Cal	47.79	Floating pan.
		Kingsbury Bridge, Cal	59.49	Ground.
Los Angeles, Cal	37.2	Arrowhead Reservoir	36.60	Ground. (Elev. 5,160 ft.)
San Diego, Cal	37.5	Sweetwater Reservoir	57.55	Floating pan.

The results above given are not strictly comparable, since the stations are not in all cases identical, and in some cases, especially in California, the reservoirs are at a greater height than the Weather Bureau stations, and in consequence the water surfaces are correspondingly colder. Generally speaking, Russell's results appear to be the higher.

Since Russell's equation was deduced from tridaily observations, it is not applicable to the present 8 a. m. and 8 p. m. observations of the Weather Bureau unless one first applies a correction to the mean of these two observations to reduce it to the mean derived from tridaily observations. The equations of Fitzgerald and Carpenter appear to have a quite general application, provided we know the temperature of the water surface, the dew-point, and the wind velocity. It would seem, therefore, that in the absence of reliable measurements of evaporation from water surfaces, an effort should be made to determine the temperature of water surfaces near Weather Bureau stations, and where the evaporation is measured from tanks sunk in the ground the relation between the temperature of this evaporation surface and the temperature of lakes or reservoirs in the vicinity should be carefully determined.

Seasonal evaporation naturally varies with geographical position. Some of its peculiarities are shown in the following table:

Evaporation in inches.

Month.	Boston, Mass.	Fort Collins, Colo.	Clear Lake, Cal.	Fort Bliss, Tex.
January	0.90	1.50	0.85	2.35
February	1.20	2.00	0.60	2.45
March	1.80	3.50	2.00	6.25
April	3.10	5.00	2.82	7.35
May	4.61	6.50	3.85	10.85
June	5.86	8.00	4.30	11.20
July	6.28	9.50	5.90	9.60
August	5.49	8.50	4.70	9.50
September	4.09	6.50	3.72	9.20
October	2.95	4.50	2.12	6.80
November	1.63	2.50	0.65	4.15
December	1.20	1.50	0.85	2.95
Year	39.11	59.50	32.38	82.65

Several series of evaporation measurements that do not cover the winter season have not been referred to in this paper. While they are of value, the above table indicates the importance to irrigation engineers of making the readings throughout the entire year.

PERPENDICULAR COLD AIR MOVEMENTS AS RELATED TO CLOUD VELOCITY.

By William Abner Eddy, Bayonne, N. J. Dated January 9, 1905.

While flying kites at Stamford, Delaware County, N. Y., in the Catskill Mountains, during a cloudy day threatening rain,

I found little wind to sustain the kites and enable them to lift an aerial crossbow, with which I was trying to discharge flying machine models of small diameter. I looked back at the distant mountain side as I held the kites, and I saw what I thought was a moving cloud floating along the mountain side in apparent contact with the surface, near the base of the mountain. I expected every moment that the seemingly approaching mass of mist would enshroud the kites and hide the arrow aeroplanes aloft from view. The wind velocity was probably less than six miles per hour. I waited for the cloud to approach, but it remained stationary for over two hours until rain set in, when its vaporous mass was somewhat thinned. It remained stationary with a light wind blowing right through it, but not moving it. On looking closer at the mountain, I found that a deep ravine cut the mountain side just below the cloud, and it was clear that slightly cooler air had formed a perpendicular upward column, which condensed the vapor directly above the ravine, but nowhere else.

In studying cumulus clouds I find sometimes a perpendicular circular motion like the Ferris wheel, but without much horizontal motion. In summer I have measured the velocity of cirrus clouds, and at times, during a prolonged warm wave, I have found them almost stationary. This is a rare phenomenon, which I believe is partly due to the cold air currents rising into a warmer inert mass of air. In the lower cloud levels I have seen somewhat narrow bands of vapor extending north and south. Their forward edges were often more dense than their rear edges. I think that this indicates that the cold air rises in successions of narrow ridges into a warmer stratum. The uprising long ridge of cooler air makes a dense forward edge fading away to a thinner rear edge. *If the cold ridge of air were motionless, then the warmer air of the upper stratum, even when in active motion, would have floating in it a stationary cloud.* The amount of condensation is limited in the upper warm stratum, and is soon exhausted, as shown by a long, narrow cloud formation. It is evident that the motion of the cirrus clouds from west to east is accompanied by the motion of cold air ridges from west to east and below the level of the cirrus cloud. I think the bands of clouds with heavy forward edges in the direction of motion denote rising ridges of cold air due to storm formations working their way upward from below. It indicates a specially disturbed atmospheric equilibrium. This fact is further shown by the high velocity of the stratified cumulus, sometimes making high speed from the northwest. The significant fact is that, as on the mountain side, a stationary cloud does not necessarily mean stationary air currents. This element, I think, ought to be considered in studying cloud velocities.

Although we can not entirely indorse the explanations of cloud formation given in this article by Mr. Eddy, yet we publish it because we desire to stimulate all our readers to the closest possible study or cloud phenomena until the myriad of details has been thoroughly recorded and satisfactorily explained. Sketches or photographs of cloud forms and the changes that they undergo should frequently be made, noting the direction of the wind and the detailed topography of the ground for a hundred miles to the windward. There are a number of cases on record in which a special cloud formation has been traced back a hundred miles to a distant hill, mountain, or ridge. The atmosphere is as full of eddies and standing waves as is any river at its flood flowing over a rocky bottom in what is called turbulent motion. There are many cases, such as the well-known cloud caps on mountain tops; the helm-bar cloud of the Crossfield Range, as explained in "Espy's Philosophy of Storms"; the tablecloth on Table Mountain, South Africa; in which the wind blows rapidly through a cloud. Aeronauts have been carried in their balloons directly through such clouds, and, of course, special students have always recognized the fact that the motion of a cloud is not necessarily the motion of a current of air. In fact, striated cirri and stratus formations generally move in a direction that is the resultant of the motion of the upper and lower currents between which the clouds themselves are being formed. Anyone who looks down from a hilltop upon the ocean and islands along the coast of Maine may see streaks of fog floating hither and thither, apparently in defiance of the actual movement of the air itself. Cloudy condensation may work backward or sidewise through an advancing mass of air so rapidly that the movement of the front of the cloud has no apparent connection with the movement of the air.

The penetration of a current of cold air into a mass of warm, moist air can, even in favorable circumstances, form only so slight a cloud that we doubt whether it will explain the phenomenon observed by Mr. Eddy. When the wind blows up a ravine on the mountain side the central portion of the current certainly advances much faster than the bottom or sides, and must rise faster, so that it may easily happen that it forms a cloud over the center of the ravine, just as we see clouds forming over the river valleys. It is not proper to say that slightly cooler air, rising perpendicularly, condensed the vapor in the warmer air above the ravine, but that it condensed the vapor within itself by the mechanical cooling of the air due to the work that it had to perform in expanding as it rose so rapidly. Similarly, the cirrus clouds and the long ridges of cooler air spoken of in the latter part of Mr. Eddy's article seem to us to be due to the cooling of ascending streaks and masses of moist air, not to the mixture of cold and moist air; the latter can sometimes form a slight haze, but not a thick cloud.

A CLOUD PHENOMENON AT OMAHA, NEBR.

By Rev. WILLIAM FRANCIS RIGGE, S. J., Creighton University Observatory, Omaha, Nebr.

At about fifty minutes after sunset, on July 18, 1904, my attention was attracted to a cumulus cloud about 10° high in the east-northeast which was pretty strongly illuminated by the sunlight. No other clouds, not even those near the point of sunset, showed the least trace of sunlight. The clouds were in detached bunches and covered about one-tenth of the sky. The brightness of the cloud diminished gradually, but it was still visible a full hour after sunset. The sun set on that day at 7:28 local time, or 7:52 central time.

The data I am enabled to supply are probably insufficient to measure the altitude of the cloud, which seems to have been enormous, since the sun was about 10° below the horizon.

WILLIAM NORRINGTON.

Mr. William Norrington, Observer, died at San Francisco, Cal., December 31, 1904. Mr. Norrington was born in London in 1847 and emigrated to America in time to see service in the civil war, having enlisted in the 16th U. S. Cavalry in 1863. In 1875 he entered the Meteorological Service of the Army, and, with the exception of about two years, continued in that branch of the Government service and in the Weather Bureau until his death. During the last eight years of his life he was on duty at the San Francisco station. He was a valued and faithful employee.

THE INTRODUCTION OF METEOROLOGY INTO THE COURSES OF INSTRUCTION IN MATHEMATICS AND PHYSICS.

[Continued from page 515, Monthly Weather Review, November, 1904.]

By Prof. CLEVELAND ABBE.

[Read at Chicago, Ill., November 26, 1904, before the Physics and Mathematics Sections of the Central Association of Science and Mathematics Teachers, and reprinted from School Science and Mathematics.]

Mathematics and physics go hand in hand, so closely that

we dare not think of separating them. If one experiments he keeps the mathematical laws in mind; if he studies the subject mathematically he keeps the physical laws in mind. A problem in one is also a problem in the other; both are rigorous and develop the reasoning powers, but sometimes it is easier to handle the experimental than the analytical method.

In the MONTHLY WEATHER REVIEW for 1897 will be found a splendid memoir on the "Equations of hydrodynamics" arranged for the study of the general circulation of the atmosphere. This and the corresponding solution of the complex differential equations give the mathematician more than he can handle at present, but the suggestive paper by MacMahon, read at the recent International Scientific Congress, on the n-fold Riemann surface, opens up great hopes for the future.

Meanwhile we must mingle experiment and theory; each must guide the other. The physicist may, in his laboratory, carry out some of the following experiments and at a glance perceive the resulting atmospheric motions, or the solution of the differential equations under any given special conditions that the analyst would find it difficult to attain, but can easily confirm when once the result is known.

We may experiment on small local motions before proceeding to the larger ones.

In a large room, or in a case with double glass walls, so that the inside temperature may be controlled, let a shallow stream of cool air flow along the bottom. By giving this a slight but adjustable slope the rate of flow may be regulated; by altering the bottom we may pass from water or smooth sand to wavy, rolling prairie or ranges of hills and mountains. We may imitate every variety of ordinary atmospheric motion.

By utilizing a layer of CO_2 for the bottom we may even study the flow of upper air currents over lower ones.

We make all these movements visible by introducing a little smoke, but especially by applying the so-called "Schleier" method of Foucault, as perfected by Mach and Dubois, which enables us to photograph the feeblest differences of density, whether due to pressure or temperature or moisture.

Among other problems in aerodynamics should be mentioned that more elementary one, the hypsometric formula of Laplace. Our students and the surveyors and mountaineers use this with aneroids for determining altitudes, without understanding its derivation or the sources of mistakes in applying it, especially the uncertainty of our knowledge of the temperatures of the air. Now the formulas may be deduced analytically by integration of the simple differential formula or by algebraic or geometric or arithmetical or graphic method, and all should be combined as an illustration of the unity of logic in whatever form presented. Science is but logic applied to material nature.

I will merely mention some other problems that appeal to us from both analytical and experimental points of view.

The total resistance and the pressure and motions of the air all around a resisting plate, sphere, or other obstacle.

The action of the wind in producing "suction" at the top of an open pipe or chimney.

Among problems that may be handled first by pure mathematics and then by experiment and observation are the determination of the calibration correction of a thermometer, the protruding stem correction, and the Poggendorff Correction.

These belong to elementary physics, but will give your students a chance to apply their mathematics to physical problems.

A complex trigonometrical problem involving a slight knowledge of astronomy is the determination of the duration and intensity of sunshine or the total amount of heat received by a unit horizontal surface for any moment of the day and the year. The calculation is to be made for the outside of the atmosphere, because if we attempt to make allowance for the absorption by the atmosphere the problem becomes too complex for our present purposes. The simpler problem may be treated geometrically and graphically and is essentially a matter of familiarity with "the use of the globes," as it was called one hundred years ago.

Globes and charts are vital matters in meteorology and are elegant classics in geometry. Chartography and projections and the globes themselves are too much neglected—pushed aside by the crush of new demands for instruction in every other branch of knowledge; but they are absolutely fundamental to astronomy and meteorology, terrestrial physics, and all geographic relations, and I hope to see them properly appreciated in the schools of pure mathematics and terrestrial physics. The properties and methods of construction of various equal surface projections ought to be as familiar to a student as those of the ordinary stereographic projection. The problems of chartography are beautiful for the drafting room, but more vivid and better adapted to the comprehension of many persons if worked out on the globe itself; and one does not need an expensive globe; even a homemade globe or rubber ball can be very useful.

The globes and conic section *in solido* should be handled by your students at some early stage in their education.

But, finally, to return to our aerodynamics. Nothing can be more attractive to a student than the formation of a waterspout by Weyher's method and the study of the wind velocity and pressure, the barometric pressure, the temperature, and the dimensions of the cloud column.

We simply set a horizontal disk at the top of a room or closed case into rapid rotation. Soon the air beneath is dragged into rotation down to the very floor. Below we place a dish of water, and the vapor from it is drawn up into the inner revolving vortex while at the same time thrown out; eventually it descends and ascends in regular circulation. As the disk and air increase their rotary speed, the central vortex diminishes in barometric pressure while increasing in velocity, and the moist air flowing into it cools by expansion, forming a central waterspout column or vortex. Here we begin to be stirred with a desire to measure. We insert a long Pitot tube and determine the wind pressure at many points and chart the pressure or velocity on ruled paper.

We insert a pair of small plane plates as in my method of barometic exposure (see Meteorological Apparatus and Methods), and determine and chart the pressure at many points. We send a thermometer or thermoelectric junction exploring the vortex and plat the temperature, or we use some form of hygrometer and determine the dew-point. In fact we experimentally determine all the elements that enter into the structure of the waterspout and compare our observations with the theories that have been worked out by Ferrel and Bigelow.

I have said enough for the present. I hope to elaborate this effort to help the mathematician and physicist to find a new field of problems for their students. Thus they will help us to develop the talents of future meteorologists.

These are but special illustrations of the general law that thinking, seeing, and doing must go together. We learn by doing as much as by reasoning—each helps the other. Every theory or hypothesis or suggestion should be reduced to exact formula, exact experiment, exact measurement. Precision is the vital essence of all valuable knowledge.

I hope to live and see special schools of meteorology, special laboratories and mathematical seminaries devoted to this as to every other profession, but for the present at least I urge that you illustrate the value of and enliven the interest in your mathematical and physical courses by frequently quoting or proposing problems drawn from meteorology.

THE STORM AND COLD WAVE OF DECEMBER 24 TO 29, 1904.

By WALTER J. BENNETT, Forecast Division, U. S. Weather Bureau.

A storm of unusual intensity, closely followed by a marked

cold wave, crossed the United States from the 24th to the 29th. The weather maps showing the progress of this storm are of special interest and will be found on Charts XIII-XV.

At 8 a. m. of the 24th the storm center was near Roseburg, Oreg., with a central pressure of 29.42 inches. It then moved rapidly due east and at 8 p. m., was over southern Idaho, with a barometer reading of 29.56 inches, an area of high pressure having in the meantime advanced over Alberta. At 8 a. m. of the 25th the storm was central near Denver, Colo., with a pressure of 29.54 inches, and the northern high-pressure area had increased in intensity and moved southward over northern Montana, where for the next few days it remained nearly stationary while increasing in intensity. Barometric conditions were favorable for a sharp fall in temperature to the north and west of the storm center, and frost, in some places heavy, occurred in the central valleys of California, while western Montana experienced a cold wave with temperatures of zero or below.

During the 25th, the storm center moved in a south-southeasterly direction to the panhandle of Texas with pressure of 29.60 inches, and the cold wave covered Montana, eastern Wyoming, and western South Dakota. Continuing a south-southeasterly movement, the storm center reached central Texas by 8 a. m. of the 26th. The cold wave had advanced over South Dakota and western Nebraska, and had extended over Wyoming, northern Nevada, and southern Idaho, the line of zero temperature reaching the southern boundary of Wyoming. During the 26th the storm reached the most southerly point of its path, and recurved, changing the direction of its motion from south-southeast to north-northeast, while it increased in intensity and in rapidity of motion. At 1 p. m. it was central over southwestern Arkansas, and at 6 p. m. was near Little Rock, Ark. At 8 p. m. it was over southeastern Missouri with a barometer of 29.56 inches. Rain fell throughout the Mississippi Valley, and was particularly heavy in its southern portion. The cold wave had advanced as far south as Taylor, Tex., and Roswell, N. Mex., and covered Nebraska, Kansas, Oklahoma, the eastern portions of Colorado, New Mexico, the Dakotas, and eastern and central Texas. During the night of the 26-27th, the storm center continued its north-northeastward movement, increasing in intensity, and by the morning of the 27th had reached northern Illinois, with a barometric pressure of 29.24 inches. Heavy rains were general throughout the Mississippi and Ohio valleys, and rain and snow fell quite heavily in the Lake region. These were the first heavy rains that had occurred in the Mississippi Valley for several months, and were much needed. In the rear of the storm, the cold wave extended from North Dakota to the Texas coast, and from the Rocky Mountains to the Mississippi River, the greatest twenty-four hour temperature fall, from 60° to 6°, occurring at Springfield, Mo. Temperatures of zero or lower were recorded as far south as Concordia, Kans., and Pueblo, Colo., and a minimum of 36° below zero occurred at Williston, N. Dak.

During the 27th the storm moved in a northeasterly direction over northern Illinois and southern Lake Michigan. The center was near Chicago, Ill., at 1 p. m., and at 8 p. m. was over southern Lake Michigan. Milwaukee, Wis., recorded the unusually low barometer reading of 28.84 inches. High winds were experienced at all Lake stations and throughout the Ohio and upper Mississippi valleys, Chicago recording a wind velocity of 72 miles an hour from the southwest. The high winds caused much damage to property along the Lake shores, houses were unroofed, and telegraph and telephone lines suffered severely. Telegraphic communication was entirely cut off over the Lake region and the Ohio and upper Mississippi valleys for twenty-four hours, and several days elapsed before the lines could be put into good working order. The heavy snow that accompanied this storm in many sections blocked trains and street cars. The cold wave covered the Mississippi Valley from Minnesota to Louisiana and extended to the Texas coast.

During the night of the 27-28th, high winds continued over the Lakes, while the storm center was passing over the Michigan Peninsula and Lake Huron. At 8 a. m. of the 28th it was near Rockliffe, Ont.; a secondary center had developed over the Atlantic coast near Long Island, and high winds were reported from all coast stations. Several vessels were wrecked near Hatteras, N. C. The cold wave extended from the Mississippi Valley nearly to the Atlantic coast, the line of zero temperature reached as far south as Keokuk, Iowa, and freezing temperatures were reported from all Gulf stations except in southern Florida and extreme southern Texas. During the day the storm center passed down the St. Lawrence Valley and high winds with snow continued on the New England coast and in the lower Lake region. The cold wave covered the lower Lake region and the middle and south Atlantic coast, but no very low temperatures were recorded in those districts. On the 29th the storm passed off to sea, colder weather followed in the Atlantic coast States, and the cold wave reached central Florida, with killing frost at Jacksonville and Tampa and a temperature of 38° at Jupiter.

SOME RELATIONS BETWEEN DIRECTION AND VELOCITY OF MOVEMENTS AND PRESSURE AT THE CENTER OF ELLIPSOIDAL CYCLONES.

By STANISLAV HANZLIK, Ph. D., Prague.

Loomis in his "Contribution to Meteorology," Chapter I, on areas of low pressure, tried to find out the causes that produce the different velocities of progression of lows. He selected for that purpose those lows moving more than 1000 miles and less than 240 miles in twenty-four hours whose pressure at the center changed very little (.02 inch) or not at all during the twenty-four hours considered. He tabulated rain, wind, pressure of the following high, and changes of pressure in twenty-four hours at the first station and also at the second station; the first station being the location of the low when first observed, the second station its location twenty-four hours later. One of the results of this investigation was to show that the rate of progress of low pressure areas is proportional to the changes of pressure on the first and second stations. Whether the lows that he compared exhibited any similarity, such, for instance, as similar forms of isobars, or whether they were primary or secondary, Loomis does not mention.

In this paper I have taken for investigation the opposite case; leaving the changes of pressure at the first and second stations out of consideration, I tried to find out whether there are any relations between the rate of progress and the change of pressure in the center of the respective lows, and how far it depends upon the azimuth toward which the low moves. I selected for that purpose, from the semidaily manuscript weather maps of the Forecast Division of the Weather Bureau, cyclones of different velocities, ranging from 50 to 900 miles in twelve hours, having at least two well shaped, closed isobars, ellipsoidal or circular (of 0.100 inch of difference). These lows are, of course, not strictly comparable in all respects, as they are of different dimensions, gradients, and ratios of axes, ranging from big circular lows extending from the Rockies to the Atlantic Ocean and from the Gulf up to the Lakes, on the one hand, to lows of long oval isobars on the other: but all are comparable in one respect; they are all primary. Their total number for the period 1893-1902 for five months, November to March, inclusive, amounts to 288. A list of all these, classified according to direction of movement, with a subclassification by months of occurrence, is given in Table 1. For instance (under east-northeast, December), will be found XIII, (November) 2p .01, referring to the cyclone track No. XIII, from 8 p. m. on the 2d of December, 1901, to 8 a. m.

on the 3d; "November" is inserted in parentheses because this length of track is shown on the November chart. I have chosen this group of five winter months because it is during these that the "southern circuit" track occurs. The lows were classified according to the trend of their movement into N., NNE., NE., ENE., E., ESE., SE., and SSE., and also according to the length of track in twelve hours. The distribution of velocities in miles is given in Table 2 for intervals of 50-150, 150-250, etc., and also separately for 0-100, 100-200, etc. I have done this because it was found that the 288 cyclones were not sufficient to give consistently the average values of pressures or pressure changes for each class of cyclones of different velocities. I have, therefore, used smoothed values of these quantities as shown in Tables 3 and 4, which were both calculated by the formula $\frac{a+2b+c}{\alpha+2\beta+\gamma}$, where, in Table 3, b is the sum of the pressures of all cyclones in the class considered, and a and c are the sums of pressures in the preceding and following classes, respectively. α, β, and γ are the numbers of cyclones in these three classes, respectively. For example, the value 29.177 inches, given in Table 3 for cyclones moving toward the north with velocities of 100 to 200 miles in twelve hours, is obtained by adding the pressures of all cyclones in the classes 50-150 miles and 150-250 miles to twice the sum of the pressures of cyclones in class 100-200 miles, and dividing the total by $21 = (1 + 2 \times 7 + 6)$. A similar method was used in computing Table 4. In order to compute the above-mentioned averages the data were read off from the daily map and tabulated as follows:

(1) Pressure at the center of the low at the first location (8 a. m. or 8 p. m.).

(2) Pressure at the center of the low at the second location twelve hours later (8 p. m. or 8 a. m.).

(3) The length of the track between these two locations, for which length I shall use the word "velocity." Weight is to be given only to the averages for the four azimuths, NNE., NE., ENE., E., with velocities 300-600 miles. From the general trend of the data within these limits we may infer the probable results outside of these limits where the data are not sufficiently numerous to give reliable averages.

I do not wish to place much weight on the absolute values of the pressures and pressure changes; they should be considered merely as relative numbers showing how these elements change for each azimuth and for different velocities.

Having thus computed the smoothed averages of pressure and pressure changes for each azimuth, I added in the last column of Tables 3 and 4 the true general averages. These are not computed from the preceding columns, but represent the sums of all cases for the given range of velocities divided by the number of cases. Many of these numbers in Tables 3 and 4, especially for the extreme velocities, are inclosed in parentheses, either because they are not an average but simply the only case that occurred, or because the average does not conform to the general series of numbers, being too high or too low on account of some one extraordinary case entering into it.

The discussion of these Tables 3 and 4 is the subject of this paper. I have also presented them in diagrams on fig. 1 as "pressure-velocity curves" and "pressure-change-velocity curves." These curves give the pressure or change of pressure as a function of velocity of lows for each azimuth of motion. These are smoothed curves and show the general trend of direction for the smoothed numbers given in Tables 3 and 4. (We must consider the ESE., pressure curve a very rough approximation.) I have also added as a heavy black line the average curve, drawn to accord with the numbers given in the last columns of these tables.

The results drawn from these two sets of curves are as follows:

(1) The pressure curves ascend with each increase of velocity, that is to say, on the average the lows moving with greater velocity have greater pressure (absolute sea level) at the center and vice versa.

(2) Though much alike, the angles made with the velocity axis by the tangents to the pressure curves are not the same for different azimuths of movement. If we count these azimuths clockwise from north eastward, we see that the gradient $\Delta B : \Delta v$ (ratio of increase of pressure to increase of velocity) decreases as we go from N., curve over to NNE., NE., and ENE., but increases again when we pass over to the curves with southerly component of direction, or ESE., SE., SSE.

(3) The pressure change curves generally pass from positive to negative changes as velocity increases. They give the average change in pressure in twelve hours for cyclones moving in each different azimuth and velocity. These curves show average dips that decrease as the azimuth changes from N., to NNE., NE., ENE., and E., increasing afterwards, so that the greatest dip is for the curves of N. and SE. direction.

(4) The pressure-change curves for different azimuths do not all cross the line of zero change at the same point, but with each change of azimuth from north through east to south-southeast the crossing shifts toward greater velocities.

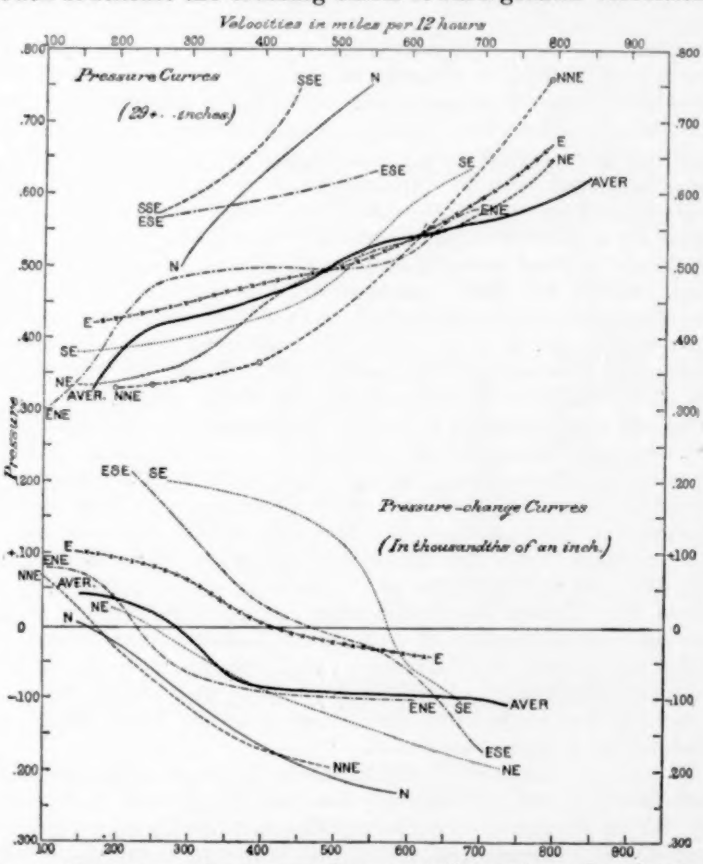

FIG. 1.—Pressure and pressure changes at the centers of cyclones of different directions and velocities of progression.

The logical explanation of these points I would give as follows:

Section 2 seems to me to indicate the influence of upper westerly drift on the movements of lows. If we look over the curves for the velocities of 300 to 600 miles in twelve hours, we see that the ENE. curve runs pretty nearly parallel to the velocity axis (the axis of abscissas) showing only a very slight increase of pressure for the higher velocities.

If we go over to the next adjacent azimuth in either direction, toward the north or toward the south, this increase becomes larger, which means that lows of various velocities that go over the American Continent with the prevailing westerlies

and move toward the ENE. and E. do not show so great a range of pressure at the center as do those lows whose azimuths of direction form a greater angle with the prevailing westerlies.

Section 3 shows that the pressure-change curves decrease their dip as the azimuth increases (from north to east clockwise) increasing in dip afterward, and the point of zero change shifts continuously toward higher velocities with increasing azimuth. These curves, as mentioned above, give the changes of pressure that the lows experience when progressing in different directions and at different velocities in twelve hours.

But we see that for a low moving with a given velocity the amount of increase or decrease of the pressure, and so also of the velocity itself, depends on the azimuth in which it moves, or, in other words, it depends on its relation to that velocity which corresponds to the zero crossing of the respective azimuth.

Let us for instance consider a low moving at the rate of 350 miles in twelve hours and in any of the azimuths here considered.

With lows moving toward the N., NNE., NE., ENE., there would be reduction of pressure in the center, as we see from the pressure-change curves. The greatest or most rapid fall would be for those with northerly component of direction, the smallest for the east-northeasterly. This means that the northward moving low would experience the greatest reduction in velocity of progression. This great reduction of pressure would cause steep gradients, and the drawing of the air from all sides would give a good opportunity for the development of larger circular cyclones than in any other azimuth, especially if an opposing high in the east (St. Lawrence high) stops for a short time or moves very slowly eastward. There are really a good many evidences that lows, even small in extent, which on their passage on the eastern path of the southern circuit were deflected toward the north by the St. Lawrence high, developed into big circular storms. Professor Garriott's "Storms of the Great Lakes" (W. B. No. 288, Bulletin K, 1903), gives many excellent examples of this.

Let us now consider a low moving toward the E., ESE., or SE. at a velocity of 350 miles in twelve hours. All the corresponding pressure-change curves show that there is a tendency toward increase of pressure at the center, and that this is greatest in the case of a low moving toward the southeast, and parallel with the increase of pressure there is also, as the pressure curves show, an increase in the velocity of progression. This is the reason why, for instance, a big circular low in the proximity of the Great Lakes, if the retarding influence of the St. Lawrence high ceases, experiences an increase of pressure at the center on the way eastward, with decrease of energy, until the influence of its transition from land to sea becomes apparent.

If we consider lows of 500 miles we see that at that velocity lows moving eastward already decrease in pressure and velocity, while those moving toward the east-southeast would not increase in pressure and velocity so much as would the southeasterly, so after all it is apparent that the southeasterly moving lows are able to develop the greatest velocities, greater than lows moving in any other direction. In corroboration I wish to quote from my paper (MONTHLY WEATHER REVIEW, August, 1904, p. 363, and Chart XIII). I mention there high velocities over 60 miles per hour along the eastern Rocky Mountain slope. Now the explanation of high velocities along the Atlantic shore is obvious, since the lesser friction on the sea surface is an important factor. But how about these fast lows on the eastern slope of the Rockies moving with extremely great velocities in the southerly direction? Is that due to the fact that the American lows in comparison with the European have the steepest gradients usually on the western side?

Now we have seen from the preceding results and Section 1 that increase of pressure goes hand in hand with increase of velocity and vice versa. Hence the obvious explanation seems to me to be the following:

In cyclones we have to deal with the ascending currents in the front and descending in the rear. The pressure in the center may be considered as a balance between supply and discharge of the air due to these currents. If the pressure falls it means that less air is supplied in the rear than is discharged in the front. If the pressure rises it means an excess or increase of descending currents in the rear. These descending currents turn anticlockwise and flow into or feed the right side of the cyclone, increasing thus the winds and gradients in this portion, and therefore, according to Koeppen's law, increasing the whole progressive energy of the low in an easterly direction. Therefore increase of pressure in the center would correspond to increase of easterly velocity and vice versa, if there be no other causes that influence the velocities of the low.

The changes of pressure and velocity are corresponding, and as they oscillate up and down they work toward a steady condition of dynamic equilibrium or a certain velocity, which is different for different azimuths, and at which there would be no change of pressure at the center. This "certain velocity" is therefore that which we know under the term of "average" velocity, and this average velocity is different for each azimuth of movement. So if in Table 4, or fig. 1, we follow the line of zero change, we obtain for different azimuths the respective average velocities. We see that the average velocity increases with increasing azimuth. So, for instance, the average velocity as taken from the pressure-change curves for the lows going in a northerly direction is smallest being about 170 miles (in twelve hours), increases toward NNE. (about 180 miles), NE. (260 miles), ENE. (235 miles), E. 420 miles), ESE. (475 miles), and for SE. (if the four cases amount to anything) would be about 585 miles. So we see that cyclones traveling SE. would move in general with the greatest velocities.

If we take the average pressure-change curve, based on the data for all azimuths, we see that it crosses the line of zero change something below 300 miles (per twelve hours). From the data given in the MONTHLY WEATHER REVIEW (1893-1902) for the months here considered I have computed the average velocity to be 354 miles (per twelve hours). That is, the difference between the results obtained by these two methods is about 60 miles (in twelve hours). If we remember that this average (354 miles) includes also many secondary lows of various shapes, whose great velocities are hardly ever reached by the well-shaped ellipsoidal cyclones selected for consideration in this paper, we may say that there is a good coincidence between the data for "average" velocities obtained by these two quite different methods.

From this we see that we may now give our numerical term "average" velocity a more definite significance from a dynamic point of view; namely, it is the theoretical velocity of movement of a low at whose center the pressure neither increases nor decreases. This ideal case is, of course, hardly ever realized, especially if we have in mind the change of form of the low from day to day, the great influence of highs, and the influence of the physiographic features of the earth's surface, for instance in the transition from land to sea and vice versa.

The reader may have the impression that, in discussing the relation between velocities of movements of lows and pressure at their center, I have attempted to show that the former is the effect of the latter. This was not my intention, as the reverse may be the case, and it is also possible that both pressure and velocity may be the result of a third cause not considered in this paper. A discussion of this point would lead to a discussion of the theory of cyclones, whereas my purpose in the present paper is only to show the relation between

pressures and velocities in well-shaped ellipsoidal primary cyclones.

TABLE 1.—*List of the cyclones studied.*

NORTH

November: I. 2a. 96.
December: VIII. 22p. 00; V. 15p. 02; VII. 10p. 99; V. 15a. 02.
January: XII. 29a. 00; VIII. 19p. 98.
February: VI. 27p. 02.
March: VII. 24a. 01; VI. 15a. 98; VI. 14p. 98; VI. 20a. 01.

NORTH-NORTHEAST.

November: IX. 21p. 98, XI. 27p. 93; VIII. 26a, 96; XII. 27a. 93; IX. 25p. 95.
December: V. 13p. 97; VIII. 23a. 00; VII. 11p. 99; V. 14p. 97.
January: VIII. 21p. 02; I. 1a. 93; II. 6a. 99.
February: VIII. 22a. 00; VIII. 20p. 00; VI. 28a. 02; III. 6a. 96; XII. 27a. 93; VIII. 26a. 99; I. 1p. 02.
March: VI. 19p. 01; VIII. 26a. 02; IV. 9p. 01; X. 28p. 99; IX. 27p. 98; V. 11a. 99; IX. 27a. 98.

NORTHEAST.

November: I. 1a. 97; 11. 4p. 97; VIII. 25p. 02; I. 2a. 97; X. 30p. 99; XIII. 25p. 00; IX. 21a. 98; X. 23a. 01; III. 5p. 02; II. 1p. 94; III. 10a. 96; XIII. 24a. 00; XII. 22a. 00; IV. 9p. 98; XI. 21a. 00.
December: V. 18p. 98; VI. 20p. 02; II. 3p. 98; V. 19a. 98; III. 9p. 01; VI, VII. 12a. 94; VI. 9a. 93; XII. 26a. 95; I. 3p. 99; V. 14a. 01; I. 2a. 02; I 2p. 93; XIV. 30a. 95; V. 14p. 02.
January: XV. 20p. 94; I. 3p. 97; IX. 21a. 95; IX. 22p. 98; IX. 22a. 98; VI. 11p. 93; X. 25p. 95; XIII. 30p. 01; II. 6a. 01; X. 24p. 98.
February: VII. 22a. 99; III. 17p. 02; III. 17a. 02; V. 26a. 02; XII. 27p. 93; VI. 17a. 93; V. 9p. 94; VI. 27a. 02; VI. 12a. 94; V. 9a. 94; VIII. 25p. 99; VII. 12p. 96; IV. 8p. 96; I 5a. 00; I 2p. 01; III. 5p. 96; III. 7p. 00; VI. 11a. 94; V. 12p. 00.
March: V. 15a. 02; II. 3a. 99; V. 13a. 01; V. 12a. 01; VI. 15p. 98; IX. 23a. 93; XII. 15a. 94; IV. 10a. 01; II. 5a. 99; III. 6a. 00; IV. 19p. 96; IV. 10p. 98; VII. 10p. 94; IV. 18p. 96; II. 4a. 99; X. 29a. 99; IV. 12a. 02; IV. 11a. 96; IX. 28a. 02; V. 12p. 98; X. 27p. 99.

EAST-NORTHEAST.

November: XIII. 26a. 00; IX. 22a. 98; X. 21p. 93; VI. 11p. 01; II. 5a. 97; I. 1p. 97; IV. 10p. 97; IV. 10a. 98; VIII. 25a. 02; VII. 19a. 95; III. 9a. 97; XII. 22p. 00; XII. 29p. 93; III. 11a. 96; I. 2p. 97; VII. 25p. 97.
December: V. 13a. 97; V. 18a. 98; X. (November) la. 99: VI. 21a. 02; I. 3a. 93; I. 2p. 02; II. 4p. 02; I. 2a. 95; II. 4a. 98; XIII. (November) 2p. 01; IX. 16p. 93; VIII. 27a. 01; IV. 12p. 02.
January: VIII. 22a. 02; XV. 20a. 94; VIII. 20a. 98; I. 1p. 93; IX. 20p. 95; IV. 11p. 01; VIII. 20a. 02; XI. 26p. 99; VII. 15a. 98; IV. 4p. 94; IV. 11a. 01; VII. 14p. 98; X. 24p. 99.
February: V. 25a. 02; VIII. 21p. 00; II. 4p. 98; VII. 21p. 99; I. 3a. 01; I. 4p. 00; VIII. 25a. 99; II. 5a. 98; I. 2p. 93; III. 9p. 93; IV. 9p. 96; XII. 28p. 00; VII. 13a. 96; II. 6a. 93; III. 9a. 93; IV. 14p. 93; III. 8p. 01.
March: IX. 13p. 94; VI. 12p. 93; VI. 19a. 01; IV. 8a. 93; VI. 19a. 96; VI. 13p. 93; V. 10p. 93; VI. 14p. 99; VII. 19p. 98; VII. 19a. 99; V. 14a. 97; VIII. 22p. 98; III. 7p. 02; IV. 4a. 95; IV. 12a. 97; IV. 12p. 02; VII. 17p. 99; II. 5a. 97; V. 13a. 98; VII. 25a. 01; VIII. 25p. 96.

EAST.

November: X. 22a. 93; III. 7a. 01; IV. 14a. 99; II. 5p. 97; X. 21a. 93; III. 6p. 01; XIV. 26p. 94; VI. 21a. 97; IX. 29p. 02.
December: VII. 24a. 02; VI. 20a. 02; IX. 16a. 93; III. 8a. 94; XI. 18p. 93; XII. 20p. 94; VI. 9p. 93; IX. 15p. 93; XII. 21a. 94; III. 7a. 95; I. 2a. 93; VII. 12a. 93; IX. 16p. 94; III. 8p. 00; X. 22a. 96.
January: X. 24p. 00; XI. 25p. 99; III. 10a. 01; VIII. 21a. 02; XI. 26a. 99; VI. 12a. 98; X. 25a. 98; IX. 21p. 01; VIII. 20.p. 02; VIII. 18a. 95; X. 25p. 98; VII. 15p. 98; V. 18p. 02; III. 8a. 99; IV. 8p, 98; III. 9p. 00.
February: XII. 28a. 00; VIII. 21a. 00; I. 3p. 00; I. 2a. 02; V. 15a. 98; XI. 23p. 93; IX. 6p. 95; I. 4a. 00.
March: V. 11a. 93; V. 12p. 01; IX. 29a. 02; VI. 13a. 93; IX. 13a. 94; XIII. 18p. 94; XIII. 19a. 94; IV. 13a. 02; VII. 11a. 94; III. 5p. 00; I. 4a. 01; V. 12a. 99; I. 9a. 00.

EAST-SOUTHEAST.

November: II. 9a. 99; VI. 12a. 01; IV. 11p. 97.
December: VI. 19p. 02; IV. 12p. 00; XV. 31p. 99.
January: XIII. 17p. 94; XIII. 24a. 93; VII. 13p. 93; V. 18a. 97; II. 6p. 01; I. 8a. 01; II. 7a. 01; I. 2a. 02; XII. 31a. 98; X 25a. 00.
February: XI. 23a. 93.
March: IV. 8p. 93; VIII. 23a. 98; III. 8p. 02; XV. 20a. 95.

SOUTHEAST.

November: X. 24a. 01; IV. 11a. 97.
December:
January: III. 6p. 98.
February:
March: XII. 15p. 94.

SOUTH-SOUTHEAST.

November:
December: II. 7a. 00; V. 11a. 95; V. 11p. 95.
January:
February: IX. 18p. 96; IX. 18a. 96.
March.

TABLE 2.—*Distribution of numbers of cyclones according to velocity and azimuth of movement.*

Velocity.	Azimuth.																Total.	
	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.			
0-100	....	0	....	0	....	2 (3)	....	0	....	0	....	1	....	1	....	1	......	6
50-150	1	....	1	....	4 (5)	....	1	....	2	....	1	....	1	....	2	....	(14)	....
100-200	....	7	....	2	....	6 (7)	....	3	....	5	....	1	...	0	...	1	......	26
150-250	6	....	3	....	7 (8)	....	4	....	5	....	1	....	0	....	0	....	(27)	....
200-300	....	0	....	6	....	10	....	10	....	5	....	1	....	1	....	0	......	33
250-350	0	....	4	....	12	....	13	....	10	....	2	....	1	....	2	....	(44)	....
300-400	....	2	....	4	....	12	....	8	....	9	....	1	....	0	....	3	......	39
350-450	2	....	8	....	12	....	11	....	7	....	0	....	0	....	1	....	(41)	....
400-500	....	0	....	7	....	11	....	10	....	9	....	1	....	0	....	0	......	38
450-550	1	....	6	....	15	....	13	....	8	....	7	....	1	....	0	....	(51)	....
500-600	....	2	...	3	....	20	....	22	....	15	....	8	....	1	....	0	......	71
550-650	1	....	1	....	16	....	20	....	20	....	4	....	1	....	0	...	(63)	....
600-700	....	0	....	2	....	8	....	16	....	11	....	5	....	1	....	0	......	43
650-750	1	....	2	....	6	....	13	....	4	....	5	....	0	....	0	....	(31)	....
700-800	....	1	....	1	....	4	....	10	....	4	....	2	....	0	....	0	......	22
750-850	0	....	1	....	5	....	5	....	4	....	0	....	0	...	0	....	(15)	....
800-900	....	0	....	1	....	4	....	1	....	3	....	1	....	0	....	0	......	16
850-950	0	....	0	....	0	....	1	....	1	....	0	....	0	....	0	....	(2)	....
	(12)	12	(26)	26	(79)	79	(80)	80	(61)	61	(21)	21	(4)	4	(5)	5	(288)	288

TABLE 3.—*Pressure in thousandths of an inch (in excess of 29 inches) in the first location.*

Velocity, miles in 12 hours.	Smoothed averages.								True general average.
	N.	NNE.	NE.	ENE.	E.	ESE.	SE.	SSE.	
	29. +	29. +	29. +	29. +	29. +	29. +	29. +	29. +	29. +
50-150	(204)	(565)	(428)	300	(466)	(326)	380	(776)	(487)
100-200	177	(490)	(357)	341	(438)	(210)	380	(830)	348
150-250	(164)	331	333	418	437	(270)	(280)	....	(299)
200-300	(157)	332	352	473	472	532	(280)	570	422
250-350	(580)	342	357	488	(421)	600	(280)	594	424
300-400	(580)	390	395	493	(425)	570	(280)	629	434
350-450	580	366	471	499	483	(640)	....	672	(500)
400-500	667	340	497	497	499	(675)	460	741	465
450-550	(795)	421	487	493	485	(643)	460	....	504
500-600	780	571	511	497	509	616	500	....	525
550-650	(705)	(684)	537	515	538	592	580	....	544
600-700	(430)	636	546	557	560	578	620	....	573
650-750	(200)	595	557	579	576	(558)	620	....	560
700-800	(200)	658	604	(540)	633	(549)	....	....	561
750-850	....	760	647	(478)	661	(546)	....	....	598
800-900	....	....	....	(434)	(636)	(520)	....	....	618
850-950	....	....	....	....	....	....	....	....	....

TABLE 4.—*Change of pressure in thousandths of an inch in twelve hours at the centers of cyclones moving toward different azimuths and with different velocities.*

Velocity.	Smoothed averages.								True general averages.	
	N.	NNE.	NE.	ENE.	E.	ESE.	SE.	SSE.		
50-150	(−020)	+070	+006 (−023)	+084	(+081)	(+103)	(+040)	(−064)	+004	......
100-200	+003	+005	+015 (−037)	+078	+103	+225	(+040)	(−025)	......	+034 (+052)
150-250	+014	−042	+016 (−022)	+041	+090	(+261)	+200	(+040)	+033 (+050)	......
200-300	+020	−055	+006 (−004)	−034	+064	+196	+200	+080	......	+006
250-350	−020	−085	−027	(−095)	+076	+130	+200	+080	−008	....
300-400	−140	−151	−084	(−110)	+053	+085	+200	+080	....	−063
350-450	−140	−170	−127	−068	−018	+010	....	+080	−091?	....
400-500	−166	−178	−142	−067	−014	+002	+140	+080	....	−100?
450-550	−220	−200	−109	(−109)	−003	+008	+140	....	−087?	....
500-600	−220	−222	−097	(−104)	−017	+014	+080	....	....	−070
550-650	−220	−258	−127	−074	−033	000	−040	....	−078	....
600-700	(−150)	−290	−170	(−045)	−041	−084	−100	....	....	−085
650-750	(−080)	(−272)	−194	(−053)	(−006)	−160	−100	....	−107	....
700-800	(−080)	(−250)	−199	−078	(+041)	−195	....	....	....	−105
750-850	....	(−275)	(−159)	−077	(+020)	(−113)	....	....	−084	....
800-900	....	−300	(−118)	(−063)	(−026)	(+060)	....	....	....	−072
850-950	....	−300	....	....	(−053)	....	....	....	....	....

NOTES AND EXTRACTS.

NITROGEN IN RAIN WATER.

Meteorologists generally consider that they have done their duty by the rainfall when they measure the quantity and the time of occurrence, either daily or hourly. But the students of agriculture and forestry, those who drink rain water, and those who study the physics of the atmosphere are all alike interested in the chemical composition of the rain water. The time must come when chemical analysis of the rain water will be made systematically at a large number of carefully selected rainfall stations. It is hardly desirable that any of these should be located in large cities, since the rain that falls there has so little influence on agriculture or water supply. The most important stations will be those in the open country, whether inland or near the seacoast, and especially those at mountain tops and base stations. The importance of this subject to agriculture may be estimated from a statement by Mr. H. Ingle, in charge of the chemical work of the Department of Agriculture of the government of the Transvaal. According to "Nature", Mr. Ingle finds that Transvaal soils are deficient in nitrogen, but that the receipt of combined nitrogen from the atmosphere, namely, nitrates, ammonia, etc., is much larger than in England. Thus, at Rothamsted the average annual receipt of atmospheric nitrogen in the rain water amounts to 4.75 pounds annually, whereas in February and March, 1904, in Pretoria, the rainfall brought down about two pounds per acre. As the normal rainfall for these two months is seven inches, while the annual rainfall is thirty inches, it may, therefore, be estimated that the annual quantity of nitrogen brought down by the rain at Pretoria is at least eight and possibly ten pounds per acre, or twice as much as received at Rothamsted in England.

By analogy we may anticipate that the varying proportions of nitrogen brought down in different portions of the United States by the rainfall may be an important consideration in explaining the agricultural peculiarities of special regions.—*C. A.*

THE VAPOR PRESSURE OF MERCURY.

The measurement of atmospheric pressure by means of the mercurial barometer is subject to a slight additive correction, by reason of the fact that the vacuum chamber is filled with the vapor of mercury pressing down on the column and making the atmospheric pressure appear smaller than it actually is.

Professor Morley has recently published the results of a series of determinations of the vapor pressure of mercury at temperatures between 0° and 100°.[1] The results previously given are, as he points out, based mainly upon interpolated or extrapolated values and are widely discordant. Professor Morley's method consists in passing a pure and dry inert gas, either carbon dioxide or hydrogen, through a weighed quantity of mercury contained in Winkler absorption tubes, the current of gas being so slow and contact with the metal so thorough that the gas becomes perfectly saturated with the vapor of mercury. The volume of the gas is measured, and gives, when reduced to the temperature of the mercury, the volume of the saturated vapor. The loss of weight of the mercury in the absorption tubes gives the weight of this saturated vapor, and from these data the pressure of the vapor may be computed.

In one series of experiments, each of which continued for about two weeks, the mercury was kept in a room whose nearly constant temperature was measured by a thermograph. In another case the mercury was immersed in a water bath maintained at constant temperature.

[1] On the vapor pressure of mercury at ordinary temperatures. London, Edinburgh, and Dublin Philosophical Magazine, June, 1904, pp. 662-67.

The following table indicates the method of calculation and gives the results.

The last column is computed by the formula—

$p = ab^t$, in which $\log a = 4.6064$ and $\log b = 0.02856$.

Vapor pressure of mercury.

Temperature.	Weight of 1 liter of mercury vapor.	Weight of 1 liter of mercury vapor at 1 mm.	Vapor pressure observed.	Vapor pressure computed.
°C.	*Milligram.*	*Milligrams.*	*Millimeter.*	*Millimeter.*
0	....	....	....	0.0004
10	....	....	....	0.0008
16	....	....	0.0010	0.0012
20	....	....	....	0.0015
30	0.028	10.60	0.0027	0.003
40	0.054	10.26	0.0052	0.006
50	0.112	9.94	0.0113	0.011
60	0.206	9.65	0.0214	0.021
70	0.378	9.37	0.0404	0.040

These results agree well with those computed by Hertz from 0° to 50°. They are about one-tenth as large as the values found at 0° and 10° by van der Plaats, who used a similar but somewhat less simple method. Professor Morley states that his own values "have now been found the same in experiments made in three different years and with many modifications of apparatus."—*F. O. S.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Prof. H. J. Cox, Chicago, Ill., reports that classes from the schools named below visited the local office of the Weather Bureau during 1904 and were given instruction in the work of the Bureau by some one of the assistants on duty at the station.

February 27 and March 5, Mayfair High School.
March 7 and 8, Austin High School.
March 18, 21, 22, and 23, West Division High School.
April 7, Austin High School.
April 15, West Division High School.
April 28, Young Men's Christian Association Institute.
July 28, John Spry Vacation School.
October 21, Austin High School.
December 8 and 10, University of Chicago.
December 10, Morgan Park High School.

Mr. Charles Stewart, Observer, Spokane, Wash., lectured at the local office on December 9 to the 45 pupils constituting the physical geography class of the Spokane High School on meteorology and the work of the Bureau. Forecasting was touched upon, and the fallacy of long-range forecasts and the moon's influence on the weather were discussed.

Mr. George A. Loveland, Section Director, Lincoln, Nebr., on December 28 spoke briefly before the "Teachers of Science" section of the Nebraska State Teachers Association on the subject of meteorology in the public schools. Mr. Loveland was subsequently elected secretary of the section, of which he has been a member for many years in virtue of his position as instructor in the University of Nebraska.

Mr. Clarence J. Root, Assistant Observer at Charles City, Iowa, reports that on December 10 the office was visited by the superintendent of schools and the seven teachers of the Charles City High School. The instruments were explained and the work of the Bureau and the movement of storm areas discussed.

Mr. H. W. Richardson, Local Forecaster, Duluth, Minn., on December 7 delivered a lecture of about an hour's duration, on the Weather Bureau and its work, to twenty students of the class in physiography of the Superior State Normal School.

Mr. John R. Weeks, Observer, Macon, Ga., delivered two lectures before the students of the science department and members of the faculty of Wesleyan Female College. These lectures were given on November 29 and December 7 and were illustrated with the stereopticon, about one-hundred and seventy-five views and charts being shown. The topics treated were as follows:

FIRST LECTURE.

A brief history history of the science and its progress.
The U. S. Weather Bureau and its work.
A description of the instruments used.
The earth and the sun—the sun the source of all weather.
The atmosphere and its general circulation.
How cyclones and anticyclones are formed.
Their structure and general characteristics.
Some typical cyclones and anticyclones charted and miscellaneous views showing frosts, snow, floods, progress of cold waves, blizzards, etc., caused by them.
Weather forecasting, how its done, its limitations, and its practical application.
To-day's weather (charted) and today's forecast.

SECOND LECTURE.

Hurricanes, a special type of cyclone.
Local storms and their connection with cyclones and anticyclones.
Tornadoes.
Thunderstorms.
The simple physical laws governing the general condition of the atmosphere.
Rain, its formation, distribution, and effect on life.
Temperature, its distribution and effect on life.
Sunshine, its distribution and effect on life.
Climate, a summary of its controls and divisions.

Mr. R. M. Hardinge, Local Forecaster, Syracuse, N. Y., on December 3 lectured at the Weather Bureau office to the physical geography class of the Fayetteville High School on the instruments and forecast work of the Bureau.

Mr. Alfred F. Sims, Local Forecaster, Albany, N. Y., lectured on December 9, at the Weather Bureau office, to a class from the Rensselaer High School.

Mr. S. S. Bassler, Local Forecaster, Cincinnati, Ohio, on December 30 lectured before the Farmers' Institute at Collinsville on "Weather and Weather Forecasting."

KITE WORK BY THE BLUE HILL OBSERVATORY AND THE UNITED STATES WEATHER BUREAU.

In the following communication Mr. A. Lawrence Rotch, Director of the Blue Hill Observatory, calls attention to an apparent inaccuracy in the October REVIEW:

To the EDITOR OF THE MONTHLY WEATHER REVIEW.

The article by S. Tetsu Tamura in the October REVIEW contains a misstatement on page 464, namely: "While the Weather Bureau was conducting this work kiteflying was begun at the Blue Hill Observatory under the direction of Mr. A. L. Rotch." It was said previously: "In 1895 the United States Weather Bureau decided to equip with kites a number of stations." The fact is, however, that in 1894 kites were flown at Blue Hill to obtain meteorological records, and these records, with a description of the apparatus, were published in the Annals of the Harvard College Observatory, Volume XLII, Part I.

A. LAWRENCE ROTCH,
Director.

BLUE HILL METEOROLOGICAL OBSERVATORY,
Hyde Park, Mass., January 12, 1905.

If the expression "this work" in the sentence quoted refers to the use of self-recording instruments, then it is, as Mr. Rotch has pointed out, a mistake. The use of kites by the Blue Hill Observatory to obtain continuous meteorological records antedates their use for that purpose by the United States Weather Bureau. Professor Marvin, in the MONTHLY WEATHER REVIEW for April, 1896, page 114, has referred to the fact that kites were used at Blue Hill in 1894 to secure observations of atmospheric conditions at as high elevations as possible.

In connection with the more important events in the kite work of these two institutions, the following dates are worthy of record. So far as they relate to the Weather Bureau, they are taken for the most part from the notes of Prof. C. F. Marvin, to whom, more than to anyone else, belongs the credit for the form of kite and the instruments, accessories, and methods finally adopted. Work by the Blue Hill Observatory[1] is distinguished by printing the dates in italics.

May 6, 1885. A paper kite about four feet long, covered with cloth and tin foil, was used by Professor McAdie, at Cambridge, for observations of atmospheric electricity. On May 7 a height of 500 feet was attained.[2]

June 17, 1885. Similar kites were used by Professor McAdie for the same purpose at Blue Hill Observatory.[3] These experiments were repeated in June and July, 1891.[4]

August 9, 1892. Professor McAdie used a kite at Blue Hill to determine the value of the potential at points comparatively free from ground and local influences. Mr. Rotch not only placed the observatory at the disposal of the experimenter, but generously defrayed all incidental expenses.[5]

1893. Professor Harrington read a paper before the International Meteorological Congress at Chicago, Ill., on the use of kites in meteorological investigations.

1894. In the summer of this year experiments in kite flying were made by Professor McAdie and Mr. Potter. A large number of kites, mostly of the Malay type, were flown successfully at Mr. Potter's country residence.

In July and August, 1894, Mr. William A. Eddy, who had been very successful in reaching great altitudes with kites designed by himself, spent two weeks at the observatory for the purpose of elevating instruments with his kites.

August 3, 1894. An ordinary Richard thermograph was altered for use in the experiments, the heavy parts being replaced by wood and aluminum.

August 4, 1894. This instrument was raised to a height of 1430 feet.

January 18, 1895. The first Richard thermograph was purchased and records of temperature were obtained during the summer of this year.

August 18, 1895. The first Hargrave kite constructed at the observatory was flown.

August 19, 1895. The first barothermograph was elevated with kites.

September, 1895. A kite of the Hargrave cellular type, made by Mr. Potter, was successfully flown by him. Up to this time kites of the Eddy or Malay type had been used almost exclusively. The evident superiority of the Hargrave type in power and stability of flight led Mr. Potter shortly thereafter to devise the modified form of the cellular kite known as the Potter diamond kite, which can hardly be surpassed in lightness and simplicity of construction.

September 21, 1895. An improved Hargrave kite was used for raising the barothermograph.

October 14, 1895. Professor Hazen and Mr. Potter were officially assigned to the work of devising and perfecting an

[1] Annals of the Astronomical Observatory of Harvard College, vol. 42, part 1, pp. 42 and 67. Monthly Weather Review, September, 1896, vol. 24, p. 323.

[2] Proceedings of the American Academy of Arts and Sciences, N. S. vol. 12, 1884-85, p. 448.

[3] Proceedings of the American Academy of Arts and Sciences, N. S. vol. 13, 1885-86, p. 129.

[4] Annals of the Astronomical Observatory of Harvard College, vol. 40, part 1, p. 53.

[5] Annals of the Astronomical Observatory of Harvard College, vol 40, part 2, p. 122.

appliance for procuring upper air readings, as Professor McAdie had been placed on duty in San Francisco.

November 16, 1895. The first thermoanemograph was put into use.

November 18, 1895. Professor Marvin was officially directed to construct appliances for carrying meteorological instruments into the upper air, and to give attention to the construction of the necessary instruments. The first step taken by Professor Marvin was to abandon the use of twine for kite lines.

December 7, 1895. The diamond kite was publicly flown by Mr. Potter at the Weather Bureau.

December 20, 1895. Phosphor bronze was used for the kite line and a wooden reel was employed.

January 7, 1896. In order to scientifically compare the flying qualities of different kinds of kites, methods were devised for regularly observing the angle of flight and angle of incidence to the wind, the latter being obtained by means of a scale of division in bold lines stencilled on the cloth of the kite, and viewed from the reel by aid of a small telescope with graduated vertical circle.

January 10, 1896. The properties of the catenary as applied to the science of kiteflying were fully developed and tables of results computed.

January 24, 1896. The advantage of using a small motor attached to the line below the kite was considered and discussed.

January 27, 1896. Music wire was substituted for cord, and was used exclusively for the kite line thereafter. During this month waterproof kites were employed in rain or snowstorms.

February 4, 1896. Steel music wire was substituted for the bronze wire and subsequently used exclusively for the kite line.

February 13, 1896. Apparatus was devised and installed for testing the strength of wire, string, splices, etc. An improved style of splice was developed and tools devised for making such splices expeditiously.

March 5, 1896. Early in the tests of kites the marked inefficiency due to the fluttering of the cloth and looseness at the edges was noticed. On the above date a kite with the frame construction located entirely at the edges of the cell was completed and tested with very satisfactory results. This improved feature was ultimately used exclusively, and was generally adopted elsewhere in all high grade kites.

March 21, 1896. Recognizing that the greater part of the pulling power exerted by the wind upon a kite is concentrated in the front cell, a Hargrave kite with three planes in both front and rear cells was made and tested. Subsequently the third plane was omitted from the rear cell, and at this point of the work a great variety of structures were made and tested for the purpose of determining how much the surface and extent of the rear cell might be diminished. It was recognized that the prime function of this part of the kite was that of controlling and maintaining the equilibrium. Structural and constructural considerations, however, led to the adoption of the simple Hargrave kite, with three horizontal planes in the forward cell and two in the rear.

April 4, 1896. A Richard meteorograph of aluminum, recording pressure, temperature, and humidity, was used.

April 13, 1896. A height of one kilometer above the hill was attained for the first time.

July 20, 1896. A height of 1.8 kilometers, or over one mile, was reached.

July 23, 1896. A tail composed of hollow cones was attached to one of the kites at the suggestion of Mr. Douglas Archibald.

August 1, 1896. The height of 2000 meters was reached.

October 8, 1896. The height of 2665 meters, probably the greatest to which a kite had attained up to that date, was reached.

February, 1897. To facilitate the use of a greater length of line under continued strain, a new windless with a strain pulley controlled by a steam engine was constructed. During this year important modifications of the meteorograph were made and new forms of kites tested.

February 3, 1897. Safety line devised and used in ascensions.

April 21, 1897. Ascensions at Washington with thermograph on kite were continued more or less regularly on every favorable day from this date until June.

June 11, 1897. Design completed of the hand and power kite reels afterward employed by the Weather Bureau.

August 7, 1897. Drawings and specifications of the improved kite meterograph of the Marvin design were sent to contractors.

September 20, 1897. The construction of a collapsible, three plane kite of the standard type for station use was begun, to serve as a model for the use of contractors in manufacturing kites for station supplies.

October 15, 1897. The meteorograph was raised to a height of 3379 meters above the hill or 3599 meters above the valley.

March 3, 1898. The automatic power kite reel for use at the Washington station and also the hand reels for the equipment of outlaying stations had been completed. Each one of these was separately filled with wire and calibrated, in order to give the length unwound during ascensions. All other details of the equipment for stations were also completed about this time, and shortly thereafter the instruction of observers employed to fly kites at stations began.

April, 1898. Systematic ascensions were begun at seventeen kite stations, established in different parts of the country.

1899. The Weather Bureau issued Bulletin F, by Prof. H. C. Frankenfield, containing a report of the kite observations of 1898.

August, 1901. Mr. Rotch was the first to use a steamer to raise a kite on a calm day.—*F. O. S.*

STORM ON THE PACIFIC COAST, DECEMBER 27-31, 1904.

A steep barometric gradient on the northern Pacific coast during the last days of the month was accompanied by notably high winds and heavy precipitation at several points. On the 28th an area of low pressure was central at North Head, Wash., with a reduced reading of 29.7 inches, with a high area to the southeast. The low developed rapidly in intensity during the next twenty-four hours, and the reduced pressure on the morning of the 29th ranged from 29.0 inches at Tatoosh Island to 30.0 inches at San Francisco and in the neighborhood of Boise, Idaho, a gradient of one inch in about 530 miles. The pressure then rose slowly as the low moved eastward. The influence of topography on wind velocity is well shown by the records from the various stations. The time given is 75th meridian.

At San Francisco the maximum wind velocity was 38 miles from the south on the 30th, and moderate rains fell on the 29th, 30th, and 31st. At Southeast Farallon, a small island 30 miles due west of San F[illegible]isco, occasional light rains fell on the 27th, 28th, and 29th, w[illegible]h heavier precipitation beginning at 9:15 p. m. on this date. On the 27th the observer notes that the sea was unusually smooth all day, without surf. High wind began on the 28th, reaching a velocity of 49 miles from the south on the following day. Conditions on the 30th and 31st are described in the following extracts from the daily journal of the Assistant Observer in Charge, Mr. E. C. Hobbs:

December 30.—Cloudy; falling barometer until 3:15 p. m., followed by sudden and rapid rise. Wind veered from south to northwest and velocity dropped from 48 to 15 miles in fifteen minutes. Rain ended at 10 p. m.; amount, 1.35 inches.

Gale raged furiously up to 3:15 p. m.; maximum velocity of 58 miles from the south occurred at 8:45 a. m. Communication with Professor

McAdie being still interrupted, the southeast storm warning was continued until 3:15 p. m., when, it being evident that the storm had spent its fury, the warning was taken down.

This has been the most severe storm since last March. The night was a pandemonium of roaring winds, thundering surf, and driving rain. The noise prevented sleep, and the observer kept a close watch on the self-register during the entire night. All went well until the observers were at breakfast, when the anemometer broke down completely, some parts of it being blown away. Assistant Observer, Mr. James Jones, volunteered to mount the extra instrument, and a hard two or three hours followed. The extra instrument also soon showed signs of distress, and it was only by combining parts of both instruments and making some repairs that the record was started again.

Mr. Jones must have ascended the anemometer support at least a dozen times in a drenching rain, with a wind blowing between 50 and 60 miles per hour. His action was very commendable.

The east end of the bridge was wrecked again by the wind and surf, cutting off communication with the east end of the island.

December 31.—Clear; rising barometer; wind from the northwest freshened during the night, blowing a gale from 3:50 a. m. to 11 p. m. Maximum velocity of 40 miles from the northwest at 7:25 a. m. Amount of rainfall, trace. Clear in the evening.

Point Reyes Light, 30 miles northeast of the island, experienced high winds on the 29th and 30th, with a maximum of 80 miles per hour from the south at 1:25 p. m. The velocity then decreased rapidly to 25 miles, veering to the northwest at 2:45 p. m., and increasing to a maximum of 52 miles from that direction at 6:10 a. m. of the following morning. Precipitation amounted to 1.77 inches.

At Eureka, Cal., the highest wind velocity was 29 miles and the precipitation amounted to 3.92 inches, of which 3.65 inches fell in the twenty-four hours ending at 7:40 a. m. on the 30th. This was the heaviest 24-hour rainfall in any December since the station was established in 1887.

A similar heavy rainfall of 3.89 inches at Roseburg, Oreg., between 2 a. m. of the 29th and 2 a. m. of the 30th, is, with one exception, the greatest amount in twenty-four hours in the records of that station, which was established in 1877. The total precipitation at Roseburg was 4.68 inches, and the winds generally light, reaching a maximum of nineteen miles from the southeast on the night of the 28–29th, but not rising above nine miles per hour during the remainder of the month.

At North Head, Wash., strong winds from southeast to southwest prevailed from the 28th to the 31st, with maximum velocities of 74, 85, 46, and 48 miles, respectively, on those dates, and an average velocity during the 29th of 48 miles per hour. Nothing approaching these figures was reported from Portland, Oreg., or Seattle, Wash., where the maximum velocities were 22 and 29 miles, respectively, with averages on the 29th of about eight miles at the former station and six miles at the latter. The total precipitation was as follows: North Head, 3.28; Portland, 2.71; Seattle, 2.51.—*F. O. S.*

CORRIGENDA.

Monthly Weather Review for November, p. 514, column 2, 2d line from bottom, for "W C" read "W to C"; p. 515, column 2, 15th line from bottom, for "Meteorology" read "Mechanics."

THE WEATHER OF THE MONTH.

By Mr. Wm. B. Stockman, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was highest over the middle Plateau region and lowest over New England.

The mean monthly pressure was above the normal in North Dakota, northwestern Minnesota, eastern South Dakota, the Pacific districts, except on the coast of Washington and extreme southern California, the middle and southern Plateau and southern slope regions, portions of the middle slope region and west Gulf States, and southern Florida; elsewhere it was below the normal.

The greatest excess in pressure occurred in New Mexico and southwestern Colorado, and the greatest deficiency over the central Mississippi Valley, Ohio Valley, lower Lake region, Middle Atlantic States, and northern portion of the South Atlantic States.

The mean pressure for the month increased over the preceding month in the Atlantic, Gulf, and Pacific States, eastern lower Lake region, and western portions of the Plateau. In all other sections the mean pressure diminished, the most marked changes occurring over the middle slope region.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

The mean temperature for the month was generally below the normal east of the slope regions, and in north-central California, and above normal in the remaining districts.

In southeastern Texas, lower Missouri Valley, eastern middle slope region, northern portion of the South Atlantic States, Middle Atlantic States, New England, Lake region, and northern portion of the upper Mississippi Valley the changes were quite marked and ranged from —2° to —10°, the greatest deficiencies occurring in the northeastern portion of the Middle Atlantic States and in New England.

The most marked positive departures occurred over southern California, northern slope, and eastern portion of the northern Plateau regions, where they ranged from +2° to somewhat more than +4°.

The mean temperature was the lowest by 1° during any December since the establishment of the station at Block Island, R. I., Eastport, Me., Harrisburg, Pa., Nantucket, Mass., and Syracuse, N. Y.; as low as the lowest at Binghamton, N. Y., Modena, Utah, North Head, Wash., Richmond, Va., and Scranton, Pa.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	22.3	— 7.6	—31.6	— 2.6
Middle Atlantic	12	31 2	— 5.0	—25.6	— 2.1
South Atlantic	10	46.3	— 1.6	—13.3	— 1.1
Florida Peninsula*	8	60.8	— 0.4	+ 0.8	+ 0.1
East Gulf	9	49.8	— 1.0	— 3.4	— 0.3
West Gulf	7	49.9	— 1.5	+ 7.2	+ 0.6
Ohio Valley and Tennessee	11	35.4	— 2.4	—16.1	— 1.3
Lower Lake	8	25.4	— 5.1	—27.2	— 2.3
Upper Lake	10	21.1	— 3.2	—21.7	— 1.8
North Dakota*	8	15.4	+ 1.2	— 5.2	— 0.4
Upper Mississippi Valley	11	27.4	— 1.0	—15.1	— 1.3
Missouri Valley	11	27.4	— 1.3	+ 0.3	0.0
Northern Slope	7	27.1	+ 2.6	+18.3	+ 1.5
Middle Slope	6	33.6	— 1.3	+11.3	+ 0.9
Southern Slope*	6	40.6	— 1.0	+14.5	+ 1.2
Southern Plateau*	13	39.6	— 0.1	+ 3.4	+ 0.3
Middle Plateau*	8	29.3	+ 1.8	+ 7.3	+ 0.6
Northern Plateau*	12	32.3	+ 0.2	+26.7	+ 2.2
North Pacific	7	43.6	+ 1.7	+ 9.0	+ 0.8
Middle Pacific	5	48.7	— 0.1	+ 8.2	+ 0.7
South Pacific	4	55.0	+ 2.2	+16.2	+ 1.4

*Regular Weather Bureau and selected voluntary stations.

Maximum temperatures of 80°, or higher, occurred in Florida, southern and western Louisiana, southeastern Texas, and portions of the southwestern parts of Arizona and California.

The maximum temperature equaled the highest on record at Cheyenne, Wyo., and Pensacola, Fla., and exceeded it by 2° at North Platte, Nebr., and by 4° at Valentine, Nebr.

Freezing temperatures occurred everywhere except in the southern and central portions of the Peninsula of Florida, portions of the Texas coast, in southwestern Arizona, extreme southern California, and along the coast of the Pacific States.

The minimum temperature at Williston, N. Dak., was 6° lower than any recorded during December since the establishment of the station.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of December was higher than the average by 2° to 4° from western Manitoba to the Pacific coast, and was lower than the average over other parts of the Dominion, the negative departures increasing from 3° in eastern Manitoba and Keewatin to 6° in Algoma, and 9° or 10° in eastern Ontario and western Quebec, and in portions of the Maritime Provinces. In southwestern Ontario the negative departures ranged between 2° and 5°.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The precipitation was above the normal along the southern New England and middle Atlantic coasts, central Ohio Valley, about eastern Lake Ontario, in southern Wisconsin, eastern Iowa, Tennessee, southeastern Arkansas, northwestern Louisiana, extreme western Florida, east-central and extreme southern Texas, southwestern Kansas, extreme southwestern and northwestern California, southwestern Oregon, western South Dakota, and central North Dakota; elsewhere it was below the normal.

The excess of precipitation was quite marked in southwestern Tennessee and northwestern Louisiana. The greatest deficiency was reported from central California.

Kalispell, Mont., reports the least amount of precipitation during any December since the establishment of the station.

Snow occurred as far south as the central portions of South Carolina, Georgia, the Gulf States, upper Rio Grande Valley, southwestern Arizona, and northeastern California.

HAIL.

The following are the dates on which hail fell in the respective States:

Arkansas, 13, 27. California, 8, 11, 23–25. Georgia, 17. Idaho, 1. Indiana, 23. Kentucky, 5. Louisiana, 26, 27. Maryland, 12. Missouri, 26. Nevada, 25. New York, 4. Ohio, 3, 4. Oregon, 1, 9, 10, 21, 23–26, 28, 30, 31. Texas, 4, 26. Utah, 2, 12. Washington, 21, 23, 24, 28, 29, 31. Wyoming, 1, 8.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 13–18. Arizona, 8, 22. Arkansas, 3, 5, 6, 13, 16, 26, 27. California, 22, 24, 29, 30. Colorado, 25. Connecticut, 22, 23, 27, 28. Delaware, 3, 5, 24. Georgia, 12, 14–17, 19. Idaho, 8–10, 12–14, 18, 22, 23, 29–31. Illinois, 2, 3, 5, 9, 16, 24–27. Indiana, 2, 3, 5, 9, 24–26. Indian Territory, 5, 16, 26. Iowa, 2, 3, 9, 16, 18, 23–27. Kansas, 5, 25–27. Kentucky, 3, 5, 6, 17. Louisiana, 13. Maine, 23, 26–28, 31. Maryland, 2–5, 17, 24–27. Massachusetts, 5, 8, 18, 20, 23, 26–28, 31. Michigan, 18, 20, 23, 25–27. Minnesota, 9, 23, 26. Mississippi, 16. Missouri, 3–5, 11, 12, 14, 16, 17, 23, 24, 26, 27. Montana, 10, 11, 17, 29, 31. Nebraska, 12, 13, 15, 25, 26. New Hampshire, 27, 28. New Jersey, 3–5, 12, 13, 15, 24–27. New Mexico, 3, 19. New York, 4, 23, 24, 27, 28. North Carolina, 6, 11–17. North Dakota, 4, 17. Ohio, 2, 3, 5, 7, 17, 24–27. Oklahoma, 3–5, 13. Oregon, 1, 9–11, 22–25, 27–29. Pennsylvania, 2–5, 12, 24–27. South Carolina, 11, 14, 15, 17, 19. South Dakota, 1, 10, 26. Tennessee, 4, 12, 16, 17, 27. Texas, 4, 5. Utah, 1, 5, 10, 12, 21, 23–25, 31. Vermont, 27, 28. Virginia. 2–6, 9, 10, 12, 15–17, 25–27. Washington, 6–10, 13, 14, 17, 21, 24, 25, 27–31. West Virginia, 3–6, 25, 26, 28. Wisconsin, 25–27. Wyoming, 13.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	2.69	75	—0.9	— 5.7
Middle Atlantic	12	3.32	103	+0.1	— 9.2
South Atlantic	10	2.09	62	—1.3	—13.5
Florida Peninsula*	8	1.40	56	—1.1	— 0.8
East Gulf	9	3.78	83	—0.8	—17.3
West Gulf	7	3.63	109	+0.3	— 8.9
Ohio Valley and Tennessee	11	4.37	122	+0.8	—11.4
Lower Lake	8	2.50	86	—0.4	— 2.1
Upper Lake	10	1.70	77	—0.5	— 4.2
North Dakota*	8	0.85	189	+0.4	0.0
Upper Mississippi Valley	11	1.58	80	—0.4	— 2.6
Missouri Valley	11	0.78	71	—0.3	— 1.2
Northern Slope	7	0.32	62	—0.2	— 0.6
Middle Slope	6	0.52	57	—0.4	+ 1.1
Southern Slope*	6	0.39	30	—0.9	— 2.7
Southern Plateau*	13	0.72	78	—0.2	— 0.6
Middle Plateau*	8	0.84	74	—0.3	+ 1.7
Northern Plateau*	12	1.54	84	—0.3	— 2.2
North Pacific	7	7.96	94	—0.5	— 2.4
Middle Pacific	5	3.54	65	—1.9	+ 6.0
South Pacific	4	1.94	64	—1.1	— 1.0

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

The precipitation was almost wholly in the form of snow from the Ottawa Valley to the Maritime Provinces, and amounts ranging from about fifteen inches in the more western districts and in New Brunswick to nearly 30 inches in eastern Nova Scotia.

In western Ontario the precipitation was very generally less than average, part snow and part rain, the latter occurring chiefly on the 27th. In Manitoba the snowfall was between ten and sixteen inches, and in the Territories ranged from two inches in southern Alberta to about ten inches in northern Alberta and eastern Assiniboia. In British Columbia the rainfall was decidedly heavy on Vancouver Island and the lower mainland, with also a few inches of snow, while on the upper mainland there were a few moderate snowfalls and less rain.

At the close of the month, much of southern and southwestern Ontario was bare of snow, while other parts of the Dominion, excepting British Columbia, were snow covered, the depth being greatest, but not excessive, in Quebec and the eastern portions of the Maritime Provinces. In strong contrast to the conditions at the close of December, 1903, is the small depth of snow now on the higher lands of Ontario east of Lake Huron and the Georgian Bay which in the previous year were covered by 30 to 60 inches.

CLEAR SKY AND CLOUDINESS.

The cloudiness was normal in the upper Mississippi Valley; below normal in the west Gulf States, lower Lake region, southern slope, and middle and northern Plateau and south Pacific regions. In all other districts it was above the normal.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The average for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.4	+ 0.6	Missouri Valley	6.1	+ 1.0
Middle Atlantic	6.3	+ 1.1	Northern Slope	5.4	+ 0.8
South Atlantic	5.2	+ 0.5	Middle Slope	4.4	+ 0.4
Florida Peninsula	4.9	+ 0.3	Southern Slope	3.5	— 0.9
East Gulf	5.3	+ 0.1	Southern Plateau	3.2	+ 0.2
West Gulf	5.1	— 0.2	Middle Plateau	4.6	— 0.5
Ohio Valley and Tennessee	6.4	+ 0.3	Northern Plateau	6.4	— 0.7
Lower Lake	7.2	— 0.4	North Pacific	8.4	+ 1.1
Upper Lake	7.6	+ 0.5	Middle Pacific	5.7	+ 0.3
North Dakota	6.7	+ 1.5	South Pacific	4.2	— 0.2
Upper Mississippi Valley	5.7	0.0			

HUMIDITY.

The relative humidity was normal in the Ohio Valley and Tennessee, Missouri Valley, and northern Plateau region; below the normal in New England, South Atlantic and west

Gulf States, the upper Lake, southern slope, middle Plateau, north Pacific, and south Pacific regions. In the remaining districts it was above the normal.

The averages by districts appear in the following table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	74	— 2	Missouri Valley	75	0
Middle Atlantic	76	+ 1	Northern Slope	73	+ 4
South Atlantic	77	— 1	Middle Slope	70	+ 4
Florida Peninsula	82	+ 1	Southern Slope	64	— 2
East Gulf	78	+ 1	Southern Plateau	52	+ 6
West Gulf	71	— 3	Middle Plateau	64	— 4
Ohio Valley and Tennessee	76	0	Northern Plateau	78	0
Lower Lake	79	+ 1	North Pacific	86	— 1
Upper Lake	81	— 1	Middle Pacific	81	+ 2
North Dakota	83	+ 4	South Pacific	64	— 5
Upper Mississippi Valley	80	+ 2			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 253 thunderstorms were received during the current month as against 164 in 1903 and 144 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 26th, 79; 27th, 51; 25th, 21.

Reports were most numerous from: Louisiana, 28; Missouri, 22; Tennessee and Texas, 20.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz, December 18 to 26, inclusive.

In Canada: Thunderstorms were reported from Sidney, 1; Parry Sound, 27; Port Simpson, 18; Hamilton, Bermuda, 18.

Auroras were reported from Father Point, 4; Minnedosa, 1; Edmonton, 9; Prince Albert, 16.

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	9	54	nw.	Mount Weather, Va	29	64	nw.
Do	12	53	ne.	Nantucket, Mass.	13	51	ne.
Do	18	60	n.	Do	18	64	n.
Do	28	60	w.	New York, N. Y	8	53	nw.
Do	29	57	w.	Do	28	54	w.
Buffalo, N. Y	8	50	nw.	North Head, Wash	14	70	s.
Do	20	54	w.	Do	16	60	se.
Do	28	71	w.	Do	22	69	se.
Cape Henry, Va.	10	54	nw.	Do	23	54	w.
Carson City, Nev	24	62	sw.	Do	24	50	nw.
Cheyenne, Wyo.	15	52	w.	Do	28	74	se.
Chicago, Ill	27	72	sw.	Do	29	85	se.
Do	28	50	sw.	Pittsburg, Pa	28	54	w.
Cleveland, Ohio	20	60	w.	Point Reyes Light, Cal.	9	52	se.
Columbus, Ohio	20	51	sw.	Do	21	58	nw.
Do	27	51	sw.	Do	22	70	nw.
Do	28	50	sw.	Do	24	62	s.
Detroit, Mich	27	50	sw.	Do	25	62	nw.
Do	18	55	sw.	Do	29	65	s.
Duluth, Minn	18	51	nw.	Do	30	80	s.
Do	27	65	nw.	Do	31	52	nw.
Do	28	63	nw.	Port Huron, Mich	28	50	sw.
Eastport, Me.	27	50	e.	Pueblo, Cal	15	53	nw.
Hatteras, N. C.	10	50	n.	Sioux City, Iowa	27	57	nw.
Helena, Mont	15	50	w.	Southeast Farallon, Cal.	22	50	nw.
Indianapolis, Ind.	27	58	sw.	Do.	30	58	s.
Lincoln, Nebr	27	50	nw.	Tatoosh Island, Wash	1	52	sw.
Memphis, Tenn	27	56	sw.	Do	3	58	e.
Mount Tamalpais, Cal	24	54	sw.	Do	9	62	s.
Do	25	50	nw.	Do	14	72	sw.
Do	30	58	se.	Do	15	60	w.
Do	31	54	nw.	Do	16	66	s.
Mount Weather, Va.	7	50	nw.	Do	18	52	sw.
Do	8	58	nw.	Do	31	66	sw.
Do	20	60	nw.	Valentine, Nebr	16	50	nw.
Do	21	54	nw.	Do	18	52	nw.
Do	28	73	nw.				

DESCRIPTION OF TABLES AND CHARTS.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

For description of tables and charts see page 475 of REVIEW for October, 1904.

TABLE I.—*Climatological data for Weather Bureau stations, December, 1904.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.												Precipitation, in inches.			Wind.									
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							22.3	−7.6										74	2.69	−0.9										6.4	
Eastport	76	69	82	29.85	29.94	−.04	17.0	−8.5	46	28	25	−6	25	9	29	15	9	69	2.41	−1.6	11	10,376	nw.	50	e.	27	9	11	11	6.0	19.6
Portland, Me.	103	81	117	29.86	29.99	−.04	18.6	−8.8	37	19	25	−3	25	12	27	17	12	76	1.43	−2.1	7	6,106	nw.	28	sw.	28	10	13	8	5.2	8.6
Concord	288	70	79	29.65	30.00	−.06	18.6	−7.4	49	24	28	−4	25	9	45	...	...	...	1.81	−1.5	11	3,280	nw.	27	w.	29	10	6	15	6.1	10.3
Northfield	876	16	60	29.03	30.03	−.02	11.4	−10.0	48	23	22	−14	15	1	37	9	6	81	1.32	−1.4	9	4,913	n.	35	nw.	24	5	9	17	6.8	9.0
Boston	125	115	181	29.86	30.00	−.05	25.8	−5.3	49	23	33	6	25	19	36	23	17	67	2.52	−1.0	9	8,004	nw.	33	w.	29	6	10	15	6.8	12.0
Nantucket	12	14	90	29.96	29.97	−.08	30.0	−6.4	53	28	35	14	11	25	24	29	25	79	4.67	+0.4	17	13,184	w.	64	n.	18	3	10	18	7.3	24.1
Block Island	26	11	46	29.98	30.00	−.06	29.6	−6.6	53	28	35	12	11	24	27	27	23	76	2.93	−0.7	16	17,031	nw.	60	n.	18	6	9	16	7.0	19.9
Narragansett	...	9	38	...	...	...	25.2	−7.6	52	28	34	6	*	16	32				3.50	−0.2	12	...	ne.	...	...	...	10	5	16	...	23.0
New Haven	106	116	154	29.91	30.03	−.04	24.8	−7.4	48	31	32	5	15	18	31	23	17	70	3.64	+0.2	13	7,958	n.	33	w.	28	8	9	14	6.2	27.3
Mid. Atlantic States.							31.2	−5.0										76	3.32	+0.1										6.5	
Albany	97	102	115	29.94	30.05	−.03	20.4	−8.2	49	24	28	−2	14	13	32	18	15	81	1.78	−1.0	15	5,700	n.	26	n.	24	4	8	19	7.5	12.5
Binghamton	875	79	90	29.05	30.01	−.08	23.3	−5.2	54	28	30	4	10	16	38	...	...	...	1.12	−1.7	20	5,348	w.	30	w.	28	0	8	23	8.3	10.9
New York	314	108	350	29.68	30.04	−.05	28.2	−6.2	52	28	34	9	11	23	30	26	23	80	3.87	+0.6	13	10,695	w.	54	w.	28	10	4	17	6.5	26.8
Harrisburg	374	94	104	29.66	30.08	−.04	27.0	−7.4	53	23	33	7	15	21	30	24	19	73	2.39	−0.6	12	5,322	w.	40	nw.	8	8	4	19	6.8	18.4
Philadelphia	117	116	184	29.93	30.06	−.05	29.8	−5.7	54	28	36	12	11	24	30	27	22	70	2.28	−0.5	13	8,680	sw.	29	nw.	8	7	7	17	6.9	18.9
Scranton	805	111	119	29.15	30.05	−.05	24.8	...	53	28	32	2	15	18	34	23	19	77	3.71	...	24	6,226	sw.	38	w.	28	0	11	20	8.4	25.6
Atlantic City	52	39	48	29.99	30.05	−.05	31.8	−4.6	52	28	38	8	11	25	28	29	25	77	4.68	+0.8	15	7,095	nw.	27	ne.	10	10	5	16	6.2	15.0
Cape May	17	48	52	30.05	30.07	−.04	32.6	−5.3	52	28	38	12	11	27	27	30	...	...	5.38	+1.6	15	7,806	n.	36	nw.	28	8	11	12	6.2	18.6
Baltimore	123	69	117	29.92	30.06	−.07	31.6	−5.9	58	31	38	12	11	25	33	27	22	71	3.34	+0.2	11	5,503	nw.	40	w.	28	8	2	21	7.1	17.1
Washington	112	59	76	29.95	30.08	−.05	30.9	−5.3	60	28	39	6	15	23	37	27	22	74	3.33	+0.3	11	4,580	nw.	28	nw.	28	8	6	17	6.7	13.2
Cape Henry	18	11	58	30.05	30.07	−.05	39.9	−4.0	70	28	47	24	17	33	37	...	...	...	4.49	+0.6	14	12,013	s.	54	nw.	10	12	7	12	5.3	3.7
Lynchburg	681	83	88	29.32	30.09	−.05	36.0	−3.3	65	23	45	13	14	27	36	31	27	74	2.81	−0.2	14	3,187	sw.	23	s.	27	12	7	12	5.5	8.8
Mount Weather	1,725	10	57	28.16	30.04	...	27.2	...	55	31	34	7	11	20	38	24	21	80	2.67	...	11	12,779	nw.	73	nw.	28	9	10	12	5.9	14.3
Norfolk	91	102	111	29.98	30.08	−.05	39.3	−3.5	69	28	47	20	11	32	38	35	31	76	5.22	+1.6	13	7,440	n.	44	sw.	28	13	5	13	5.4	6.5
Richmond	144	82	90	29.93	30.09	−.05	35.8	...	67	28	44	12	13	27	37	...	...	...	3.71	...	15	4,176	sw.	32	sw.	28	14	4	13	5.1	8.5
Wytheville	2,293	40	47	27.62	30.08	−.07	34.2	−0.5	62	27	42	12	14	26	34	30	27	81	2.48	−0.3	14	5,620	w.	30	w.	20	12	4	15	5.7	1.6
S. Atlantic States.							46.3	−1.6										77	2.09	−1.3										5.2	
Asheville	2,255	53	75	27.68	30.07	−.09	38.6	−1.0	67	25	48	14	29	30	38	34	30	76	2.02	−0.9	11	6,494	nw.	34	se.	27	11	8	12	5.6	2.5
Charlotte	773	68	76	29.25	30.11	−.05	40.8	−2.8	71	27	49	23	29	33	30	36	31	75	2.86	−1.2	12	5,409	sw.	34	sw.	28	12	6	13	5.3	3.3
Hatteras	11	12	47	30.07	30.08	−.05	46.4	−1.8	70	28	53	29	11	40	28	43	40	82	2.72	−2.8	10	12,282	ne.	50	n.	10	13	6	12	5.9	
Raleigh	376	71	79	29.68	30.10	−.05	40.4	−3.5	73	27	49	20	11	32	37	35	30	76	3.02	−0.1	12	4,927	sw.	30	sw.	28	14	5	12	5.2	4.6
Wilmington	78	82	90	30.00	30.09	−.06	45.7	−2.6	71	27	55	24	11	36	33	40	37	80	1.74	−1.2	10	5,964	ne.	34	sw.	27	14	7	10	4.6	
Charleston	48	14	92	30.07	30.12	−.03	50.4	−1.1	72	23	58	29	29	43	28	45	41	79	1.08	−2.2	10	7,616	w.	34	w.	28	11	12	8	5.2	
Columbia, S. C.	351	167	175	29.71	30.10	−.06	45.6	−2.3	75	27	54	25	29	37	29	40	35	74	2.38	−0.6	11	7,171	sw.	40	sw.	17	11	7	13	5.9	
Augusta	180	89	97	29.92	30.12	−.04	47.2	−0.5	75	27	57	24	30	38	37	41	37	76	2.48	−0.9	12	4,772	w.	36	w.	17	13	8	10	4.6	
Savannah	65	81	89	30.06	30.13	−.02	52.0	−0.4	72	27	61	31	29	44	27	45	41	74	0.93	−2.3	9	5,759	w.	28	w.	17	9	14	8	5.2	
Jacksonville	43	101	129	30.06	30.11	−.03	55.6	−0.4	76	3	65	31	29	46	29	49	46	79	1.68	−1.2	6	6,113	nw.	42	sw.	27	11	10	10	5.1	
Florida Peninsula.							65.3	−0.9										82	0.75	−1.3										4.9	
Jupiter	28	10	48	30.07	30.10	.00	65.6	−1.1	82	5	74	39	29	58	32	60	58	82	0.49	−2.3	7	7,280	nw.	30	s.	27	7	20	4	5.2	
Key West	22	10	53	30.07	30.09	+.01	69.5	−0.5	83	3	74	56	29	65	17	64	62	82	0.34	−1.3	2	6,841	ne.	26	nw.	17	8	19	4	5.0	
Tampa	34	79	96	30.08	30.12	.00	60.8	−1.1	80	1	70	35	29	52	30	54	51	81	1.41	−0.4	7	5,523	ne.	24	w.	28	13	13	5	4.4	
East Gulf States.							49.8	−1.0										78	3.78	−0.8										5.3	
Atlanta	1,174	190	216	28.85	30.11	−.05	43.8	−1.5	68	26	51	21	29	37	31	40	35	76	3.25	−0.9	13	9,824	nw.	46	w.	17	12	7	12	5.5	0.3
Macon	370	98	99	29.71	30.11	−.05	47.9	...	72	26	57	24	30	39	33	...	...	...	3.32	...	12	4,841	nw.	29	s.	27	11	4	16	5.7	T.
Pensacola	56	79	96	30.07	30.13	−.02	53.6	−0.9	76	5	61	30	28	46	29	...	...	...	6.72	+2.8	9	7,016	nw.	38	sw.	16	11	9	11	5.2	
Birmingham	700	136	143	29.33	30.12	−.04	47.2	−1.0	72	26	56	21	29	39	41	...	...	...	5.05	0.0	11	5,876	w.	36	s.	27	12	3	16	5.6	T.
Mobile	57	88	96	30.08	30.14	−.01	52.0	−0.4	73	3	61	29	30	44	31	48	44	78	2.77	−1.7	9	4,825	nw.	26	nw.	27	10	13	8	5.2	
Montgomery	223	100	112	29.88	30.12	−.04	49.3	−0.3	75	26	59	25	30	40	34	45	42	83	3.04	−1.6	12	5,004	w.	35	sw.	27	13	5	13	5.0	
Meridian	375	84	93	29.72	30.13	−.03	47.6	−2.9	76	3	58	23	30	38	43	...	...	...	3.50	−1.8	12	4,338	w.	28	s.	26	13	6	12	5.0	
Vicksburg	247	62	74	29.84	30.11	−.04	50.0	−0.6	74	26	59	25	28	41	41	44	39	74	3.57	−1.4	10	6,005	se.	30	nw.	17	10	10	11	5.1	T.
New Orleans	51	88	121	30.08	30.13	.00	54.9	−0.6	78	25	63	32	28	47	36	50	46	78	2.37	−2.0	10	6,719	nw.	35	s.	26	11	8	12	5.6	
West Gulf States.							49.9	−1.5										71	3.63	+0.3										5.1	
Shreveport	249	77	84	29.85	30.13	.00	48.9	−0.6	77	2	58	22	27	39	35	43	37	70	9.62	+4.9	5	5,964	se.	32	w.	26	15	8	8	4.7	
Fort Smith	457	79	94	29.60	30.09	−.04	41.5	−1.3	72	2	52	12	27	31	35	36	30	70	0.55	−2.6	8	7,764	e.	42	w.	27	11	10	10	5.2	1.2
Little Rock	357	93	100	29.72	30.11	−.03	44.2	−0.8	70	24	53	19	28	35	30	39	32	68	5.64	+1.3	9	6,774	sw.	34	nw.	27	11	6	14	5.6	0.6
Corpus Christi	20	48	53	30.12	30.14	+.02	57.2	−2.1	80	2	65	33	28	50	24	52	47	75	2.47	+1.2	12	6,161	n.	32	ne.	31	8	12	11	5.7	
Fort Worth	670	106	114	29.40	30.13	+.01	47.1	...	73	25	57	19	27	37	44	...	...	...	0.36	...	2	9,708	nw.	40	nw.	16	17	5	9	3.8	
Galveston	54	106	112	30.08	30.14	+.02	55.0	−2.1	75	2	60	32	27	50	21	51	48	80	2.00	−2.0	10	8,912	nw.	42	nw.	26	10	8	13	5.2	
Palestine	510	73	79	29.58	30.12	.00	49.6	−1.8	80	2	59	22	27	40	36	44	38	72	4.08	+0.3	8	5,473	nw.	27	nw.	27	12	10	9	4.9	
San Antonio	701	80	91	29.39	30.13	+.02	52.8	−2.1	85	2	64	26	28	42	35	45	38	65	1.06	−0.8	8	5,028	nw.	39	nw.	26	16	7	8	4.3	
Taylor	583	55	63	29.51	30.14	+.03	50.4	...	82	2	61	22	28	40	41	...	...	...	0.82	...	7	6,607	s.	32	nw.	27	6	12	13	6.3	
Ohio Val. and Tenn.							35.4	−2.4										76	4.37	+0.8										6.4	
Chattanooga	762	106	112	29.30	30.14	−.02	43.2	−0.4	68	25	52	20	29	35	34	39	34	75	4.12	−0.2	13	5,719	sw.	34	sw.	28	9	9	13	5.6	1.0
Knoxville	1,004	35	88	29.02	30.10	−.06	40.0	+0.1	69	27	48	17	29	32	37	36	33	81	5.37	+1.3	14	5,854	sw.	48	sw.	27	9	2	20	6.8	T.
Memphis	397	146	154	29.70	30.13	−.02	44.2	+0.6	69	25	52	19	29	37	38	38	33	70	10.40	+6.2	12	8,780	s.	56	sw.	27	11	5	15	5.8	0.4
Nashville	546	122	134	29.52	30.12	−.03	42.0	+0.3	72	25	50	16	29	34	39	37	32	75	5.01	+1.3	11	5,987	s.	37	s.	26	11	7	13	5.4	T.
Lexington	989	75	102	28.98	30.08	−.06	34.0	−4.6	65	27	42	9	29	26	42	...	...	...	3.10	−0.3	13	9,383	sw.	48	w.	27	5	14	12	6.0	3.5
Louisville	525	114	136	29.50	30.10	−.04	35.8	−2.6	63	26	44	12	29	28	42	32	28	74	3.66	−0.2	14	7,412	sw.	48	sw.	27	7	7	17	6.5	4.6
Evansville	431	72	82	29.59	30.08	−.05	36.4	...	62	26	44	10	28	29	45	...	...	...	3.88	...	14	6,576	s.	36	w.	28	11	8	12	5.6	4.5
Indianapolis	822	154	164	29.15	30.07	−.05	29.2	−3.9	59	27	37	6	14	21	50	27	23	80	4.85	+1.7	11	8,771	ne.	58	sw.	27	7	10	14	6.0	6.4
Cincinnati	628	152	160	29.38	30.09	−.04	32.4	−4.2	63	27	41	8	14	24	41	29	25	75	3.75	+0.6	13	6,257	sw.	37	sw.	27	7	8	16	6.5	7.2
Columbus	824	173	190	29.16	30.06	−.06	29.0	−4.3	62	27	37	5	16	21	37	26	23	80	3.63	+0.7	9	9,961	sw.	51	sw.	27	5	10	16	6.7	6.1
Pittsburg	842	336	352	29.11	30.05	−.06	31.2	−3.8	70	27	38	6	11	24	34	27	22	71	2.34	−0.5	13	8,762	sw.	54	w.	28	2	7	22	8.3	8.4
Parkersburg	638	77	84	29.39	30.10	−.04	32.3	−4.3	64	27	40	−1	11	25	36	29	24	74	3.01	+0.3	11	5,023	n.	31	nw.	20	11	5	15	5.9	11.0
Elkins	1,940	41	50	27.95	30.05	−.07	31.1	−1.2	65	27	40	−4	11	22	49	28	23	76	3.19	−1.0	16	3,882	w.	24	w.	8	4	7	20	7.6	12.3
Lower Lake Region.							25.4	−5.1										79	2.50	−0.4										7.2	
Buffalo	767	178	206	29.14	30.00	−.06	24.2	−5.6	58	27	30	5	15	19	27	22	18	78	2.65	−0.7	25	13,898	sw.	71	w.	28	0	7	24	8.8	18.0
Oswego	335	76	91	29.62	30.01	−.05	21.9	−7.5	49	23	28	0	11	15	25	21	18	87	4.12	+0.7	19	9,536	se.	39	w.	28	1	3	27	9.1	28.8
Rochester	523	81	102	29.42	30.02	−.04	23.8	−4.8	50	31	30	0	16	18	22	21	18	80	2.46	−0.4	15	7,244	sw.	44	sw.	28	0	7	24	8.8	15.8
Syracuse	597	97	113	29.35	30.02	−.05	21.7	...	51	27	28	−1	10	15	34	...	...	...	2.80	...	19	9,188	sw.	47	w.	29	1	5	25	8.9	7.8
Erie	713	92	102	29.22	30.02	−.05	26.7	−5.7	61	27	32	8	15	21	28	24	21	77	1.82	−1.4	18	10,121	sw.	43	se.	27	1	2	28	9.1	12.1
Cleveland	762	190	201	29.18	30.03	−.06	27.3	−3.9	62	27	33	11	29	22	33	25	20	72	2.49	−0.1	19	13,132	sw.	60	w.	20	4	5	22	8.1	11.8
Sandusky	629	62	70	29.32	30.03	−.06	27.5	−5.0	62	27	34	9	14	21	41	...	...	...	2.31	−0.1	10	7,874	sw.	35	sw.	28	5	8	18	7.2	4.5
Toledo	628	120	127	29.33	30.04	−.04	26.2	−4.5	60	27	33	6	14	20	44	24	20	78	2.33	−0.1	13	9,360	sw.	48	sw.	27	6	6	19	7.3	8.0
Detroit	730	153	193	29.20	30.02	−.05	25.8	−3.7	56	27	32	12	28	20	38	24	20	80	1.83	−0.7	11	10,326	sw.	55	sw.	28	4	7	20	7.7	7.5
Upper Lake Region.							21.1	−3.2										80	1.70	−0.5										7.6	
Alpena	609	63	80	29.31	30.00	−.02	21.3	−3.5	44	23	28	1	16	15	30	20	17	84	1.74	−0.7	19	8,033	w.	36	nw.	28	2	9	20	8.1	9.1
Escanaba	612	40	48	29.31	30.01	−.02	19.6	−1.8	44	31	26	2	21	13	25	17	13	78	1.59	−0.3	11	6,227	sw.	33	ne.	27	3	9	19	7.4	11.7
Grand Rapids	707	127	165	29.22	30.02	−.03	24.6	−4.1	52	23	31	2	13	18	26	23	20	82	1.72	−1.2	10	9,599	sw.	42	sw.	27	5	10	16	7.5	15.7
Houghton	668	66	74	29.24	30.00	−.02	19.4	...	46	30	26	−2	15	13	21	...	...	...	3.29	...	24	5,138	nw.	32	n.	28	0	7	24	8.9	36.8
Marquette	734	76	116	29.17	30.00	−.02	20.8	−2.0	49	31	27	6	24	15	27	19	15	79	2.35	−0.1	18	9,318	w.	42	nw.	28	3	9	19	7.6	25.4
Port Huron	638	70	120	29.32	30.03	−.03	24.0	−5.8	55	27	30	7	16	18	35	22	18	79	1.55	−0.8	10	10,079	sw.	50	sw.	28	1	11	19	7.8	14.1
Sault Ste. Marie	614	40	61	29.28	29.99	−.01	14.6	−8.0	39	31	21	−13	24	8	32	14	11	86	0.98	−1.1	13	6,871	e.	38	ne.	27	4	4	23	8.1	10.0
Chicago	823	241	274	29.12	30.04	−.04	26.8	−2.5	54	23	32	2	29	21	32	25	22	79	1.21	−1.1	11	15,265	sw.	72	sw.	27	7	5	19	7.3	6.7
Milwaukee	681	124	142	29.26	30.02	−.04	25.2	−0.4	52	23	32	4	28	19	25	23	19	78	2.67	+0.7	11	10,162	w.	48	sw.	27	5	7	19	7.4	20.8
Green Bay	617	49	86	29.32	30.02	−.02	20.0	−3.8	44	23	27	−6	14	13	27	18	14	78	2.34	+0.4	9	8,899	sw.	43	n.	12	7	10	14	6.7	16.4
Duluth	1,133	11	47	28.75	30.03	−.02	14.4	−2.6	49	31	22	−10	12	7	23	13	11	88	0.90	−0.5	16	11,527	nw.	65	nw.	27	2	16	13	7.2	13.5

TABLE I.—*Climatological data for Weather Bureau stations, December, 1904*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
North Dakota.							14.8	+1.6										83	0.90	+0.2										6.7	
Moorhead	935	8	57	29.03	30.10	+.02	14.7	+2.8	44	31	25	−18	28	5	39	13	11	89	0.74	0.0	8	7,547	nw.	40	nw.	19	8	8	15	6.7	8.1
Bismarck	1,674	16	29	28.23	30.10	+.02	15.6	+0.9	47	19	25	−25	27	6	42	13	8	71	1.39	+0.7	11	7,210	nw.	45	nw.	19	9	9	13	6.0	13.9
Devils Lake	1,482	11	44	28.39	30.05	...	11.8	...	44	30	21	−25	28	3	41	10	7	83	0.31	...	6	9,514	sw.	46	nw.	19	5	8	18	7.2	3.4
Williston	1,875	14	44	27.98	30.06	.00	14.2	+1.2	45	7	25	−38	27	4	42	13	11	88	0.58	−0.1	8	6,805	sw.	48	nw.	19	4	10	17	6.8	6.9
Upper Miss. Valley.							27.4	−1.0										80	1.58	−0.4										5.7	
Minneapolis	...	102	208	...	...	...	19.9	−0.2	50	31	28	−11	28	12	32	...	...	...	0.61	−0.9	9	9,721	s.	48	nw.	20	5	10	16	...	7.4
St. Paul	837	171	179	29.10	30.04	−.04	20.4	+1.6	49	31	28	−9	28	13	28	18	14	79	0.73	−0.6	8	8,241	nw.	48	nw.	27	6	11	14	6.5	7.8
La Crosse	714	71	87	29.26	30.07	−.01	21.2	−2.4	49	31	28	−8	14	14	27	...	...	...	1.32	−0.1	9	6,050	s.	38	w.	20	9	7	15	6.4	18.0
Madison	974	70	78	28.94	30.04	...	21.4		51	23	28	−2	15	15	30	19	17	84	3.34	...	9	8,958	sw.	39	nw.	20	10	8	13	5.6	15.7
Charles City	1,015	8	58	28.93	30.05	...	18.6	...	44	31	28	−12	14	9	35	17	16	90	2.24	0.0	9	6,578	nw.	37	nw.	27	7	9	15	6.4	23.6
Davenport	606	71	79	29.36	30.04	−.06	26.7	−1.1	58	22	34	−4	28	19	32	24	21	81	2.21	+0.5	7	6,945	sw.	39	nw.	27	13	3	15	5.6	7.1
Des Moines	861	84	99	29.13	30.10	−.01	25.3	−1.5	58	22	34	−6	13	16	33	23	19	79	2.02	+0.6	6	7,033	sw.	34	nw.	27	11	8	12	5.6	22.4
Dubuque	698	100	117	29.28	30.06	−.04	23.4	−2.5	53	22	31	−12	14	16	26	21	18	81	2.37	+0.6	9	5,292	nw.	28	w.	20	12	8	11	5.6	15.5
Keokuk	614	63	78	29.37	30.05	−.07	29.9	+0.1	60	22	38	−1	28	22	33	26	23	79	1.45	−0.5	7	7,405	sw.	36	nw.	27	13	8	10	4.8	3.7
Cairo	356	87	93	29.71	30.10	−.05	38.9	−0.3	64	2	46	15	29	31	42	35	31	79	2.98	−0.4	13	7,974	s.	48	sw.	27	9	10	12	5.7	0.8
Springfield, Ill.	644	82	93	29.35	30.06	−.06	30.2	−2.6	59	26	40	1	28	21	49	27	23	77	0.57	−2.2	7	7,975	ne.	43	sw.	27	12	7	12	5.4	4.6
Hannibal	534	75	109	29.47	30.07	−.05	31.2	−0.7	63	22	40	0	28	22	32	...	...	...	1.15	−0.5	11	7,623	sw.	46	w.	27	10	6	15	5.8	6.0
St. Louis	567	208	217	29.44	30.06	−.07	34.7	−0.9	64	22	43	3	28	26	48	31	26	74	1.36	−1.4	9	9,397	ne.	42	w.	27	11	6	14	5.4	5.4
Missouri Valley.							27.4	−1.3										75	0.73	−0.3										6.1	
Columbia, Mo.	784	11	84	29.21	30.07	−.05	32.4	−2.4	66	1	42	−1	28	23	34	...	...	...	1.96	+0.1	11	7,401	sw.	39	w.	27	12	3	16	5.8	10.7
Kansas City	963	78	95	29.05	30.12	.00	32.6	+0.7	66	1	41	1	27	24	31	29	25	76	1.47	−0.1	6	7,235	nw.	32	nw.	17	10	6	15	6.0	11.8
Springfield, Mo	1,324	98	104	28.64	30.08	−.05	35.3	−3.3	64	1	43	3	27	27	29	32	28	77	1.72	−0.9	9	9,228	s.	43	w.	27	12	6	13	5.5	3.8
Topeka	...	85	89	...	...	...	31.8	−3.0	66	22	42	0	27	22	34	...	...	...	0.50	−0.4	9	8,130	s.	37	sw.	22	10	9	12	5.8	4.9
Lincoln	1,189	75	84	28.77	30.09	−.03	27.6	−2.8	60	22	38	−4	27	17	38	23	17	69	0.29	−0.5	5	9,020	n.	50	nw.	27	6	12	13	6.3	3.3
Omaha	1,105	115	121	28.86	30.09	−.02	27.5	+0.8	61	22	36	−5	28	19	34	23	17	68	0.57	−0.4	3	8,132	n.	39	nw.	27	7	13	11	6.0	6.3
Valentine	2,598	47	54	27.28	30.09	−.01	25.9	−1.3	72	30	39	−20	27	13	47	21	16	72	0.16	−0.2	5	7,565	w.	52	nw.	18	7	16	8	5.3	1.6
Sioux City	1,135	96	164	28.82	30.09	−.03	23.8	−0.3	60	8	34	−10	27	14	40	...	...	...	0.20	−0.7	4	10,792	s.	57	nw.	27	8	11	12	6.0	2.6
Pierre	1,572	43	50	28.38	30.12	+.02	21.6	−3.1	55	19	31	−15	27	12	48	18	14	77	0.34	−0.1	7	4,714	e.	25	nw.	18	6	9	16	6.8	4.2
Huron	1,306	56	67	28.64	30.11	+.01	18.8	−0.4	54	30	30	−15	28	7	46	16	14	84	0.44	−0.2	5	8,784	se.	41	nw.	18	5	12	14	6.4	5.1
Yankton	1,233	55	65	28.73	30.11	.00	23.6	+1.1	64	31	34	−12	27	13	41	...	...	...	0.41	−0.4	5	7,317	nw.	42	nw.	27	5	8	18	7.4	6.1
Northern Slope.							27.1	+2.6										73	0.32	−0.2										5.4	
Havre	2,505	11	44	27.30	30.04	−.01	21.4	+0.8	56	29	32	−35	26	11	59	19	15	78	0.45	−0.1	9	6,578	nw.	43	sw.	29	8	8	15	6.3	5.7
Miles City	2,371	42	50	27.44	30.03	−.07	26.0	+6.7	52	7	36	−20	27	16	36	22	20	87	0.14	−0.2	6	3,774	sw.	48	w.	15	15	12	4	3.9	1.0
Helena	4,110	8	56	25.78	30.10	−.03	29.0	+3.7	53	30	37	−9	26	21	32	24	18	65	0.39	−0.5	6	4,993	w.	50	w.	15	5	11	15	6.3	4.0
Kalispell	2,965	45	51	26.92	30.06	−.01	30.4	...	49	19	36	5	26	25	17	28	25	81	0.82	...	12	2,916	w.	28	sw.	31	0	7	24	8.6	2.0
Rapid City	3,234	46	50	26.56	30.06	−.03	28.4	−1.8	66	30	40	−8	27	17	43	23	18	74	0.54	+0.3	5	5,260	w.	36	nw.	16	19	1	11	3.9	3.8
Cheyenne	6,088	56	64	23.95	30.07	−.02	31.0	+2.5	64	30	42	−2	26	20	38	24	14	52	0.06	−0.2	2	9,454	nw.	52	w.	15	13	14	4	4.3	1.0
Lander	5,372	26	36	24.62	30.16	+.01	23.6	+2.8	55	30	38	−16	27	10	40	19	14	72	0.49	−0.3	4	2,486	nw.	48	nw.	15	6	22	3	4.6	4.9
Yellowstone Park	6,200	11	47	23.85	30.17	+.01	22.7	...	42	7	30	−10	27	15	27	20	15	73	1.19	...	12	6,111	s.	30	nw.	15	7	8	16	6.4	15.1
North Platte	2,821	43	52	27.08	30.10	.00	30.6	+3.5	72	30	44	−1	27	18	45	24	19	72	0.19	−0.4	3	6,315	w.	44	nw.	16	14	10	7	4.6	0.1
Middle Slope.							33.6	−1.3										70	0.52	−0.4										4.4	
Denver	5,291	129	136	24.69	30.07	−.01	34.6	+2.6	65	31	47	−10	27	22	43	28	21	60	0.41	−0.2	3	6,157	s.	40	ne.	25	16	11	4	3.5	7.2
Pueblo	4,685	80	86	25.27	30.07	−.01	34.2	+0.5	69	31	49	−5	27	19	48	26	15	54	0.43	−0.1	4	5,352	nw.	53	nw.	15	20	7	4	3.4	4.3
Concordia	1,398	42	47	28.59	30.12	+.01	29.5	−3.5	63	22	39	0	28	20	34	25	22	79	0.04	−0.1	5	5,773	s.	34	nw.	27	16	6	9	4.5	4.3
Dodge	2,509	44	54	27.43	30.13	+.03	30.4	−2.2	74	1	42	5	6	18	43	24	21	78	1.19	+0.6	6	7,414	nw.	36	nw.	26	13	6	12	5.0	11.7
Wichita	1,358	78	86	28.64	30.12	+.01	33.7	−4.2	67	1	44	5	28	23	38	29	24	73	0.24	−0.8	6	8,028	n.	37	sw.	22	15	7	9	4.8	2.8
Oklahoma	1,214	79	86	28.78	30.10	−.01	39.2	−0.9	69	1	50	11	27	28	43	34	29	73	0.48	−1.6	5	9,988	nw.	37	nw.	16	13	7	11	4.9	2.2
Southern Slope.							41.5	−0.4										64	0.40	−0.8										3.5	
Abilene	1,738	45	54	28.28	30.12	+.01	46.0	−1.5	73	1	57	19	28	35	38	38	32	64	0.10	−1.4	2	7,422	s.	36	w.	13	19	6	6	3.7	0.2
Amarillo	3,676	10	49	26.27	30.09	.00	37.0	+0.7	70	1	50	11	27	24	47	29	22	63	0.69	−0.3	5	9,783	sw.	40	n.	26	23	3	5	3.3	7.0
Southern Plateau.							42.5	0.0										52	0.41	−0.7										3.2	
El Paso	3,762	10	110	26.27	30.11	+.08	44.8	−1.3	72	1	58	23	27	32	39	36	26	57	0.84	+0.3	4	6,366	nw.	35	w.	1	20	5	6	3.0	T.
Santa Fe	7,013	33	39	23.23	30.14	+.08	29.4	−1.4	52	1	38	0	27	20	27	23	16	62	0.77	−0.1	7	5,949	ne.	30	nw.	16	21	6	4	2.7	7.5
Flagstaff	6,907	12	25	23.35	30.07	+.01	30.5	0.0	54	15	44	−4	26	18	39	24	16	62	0.42	−1.5	7	5,124	n.	32	sw.	24	14	6	11	4.4	2.9
Phoenix	1,108	50	56	28.88	30.06	+.02	52.7	+0.4	75	1	66	32	29	40	39	43	37	52	0.35	−0.5	3	2,828	e.	18	w.	25	20	4	7	3.1	
Yuma	141	16	46	29.90	30.05	.00	56.4	+0.5	77	20	69	36	31	44	35	45	31	45	0.10	−0.4	1	4,002	n.	26	n.	26	22	7	2	1.8	
Independence	3,910	11	42	26.06	30.11	−.01	41.3	+2.0	61	1	54	19	28	29	32	31	15	36	T.	−2.0	0	4,687	nw.	41	se.	30	12	10	9	4.5	
Middle Plateau.							31.6	+0.7										64	0.61	−0.5										4.6	
Carson City	4,720	82	92	25.34	30.17	+.02	34.3	+0.1	61	14	48	5	26	21	45	29	24	71	0.79	−1.4	5	4,683	s.	62	sw.	24	9	7	15	5.7	1.8
Winnemucca	4,344	18	56	25.70	30.20	+.02	31.6	+0.5	57	30	44	2	26	19	42	26	20	67	0.77	−0.5	5	5,507	ne.	34	sw.	24	11	10	10	5.1	3.4
Modena	5,479	10	43	24.65	30.14	+.02	30.3	+1.9	56	1	44	−1	27	17	41	23	17	63	0.23	0.0	4	6,970	w.	44	w.	25	18	9	4	3.3	1.0
Salt Lake City	4,366	105	110	25.70	30.18	+.03	33.0	+0.2	55	21	42	7	27	24	33	27	20	60	0.90	−0.7	8	3,623	nw.	31	nw.	15	10	9	12	5.5	7.2
Grand Junction	4,608	43	51	25.48	30.16	+.06	28.6	+0.8	52	1	41	−1	28	17	35	23	15	60	0.37	0.0	5	2,376	se.	29	sw.	15	18	9	4	3.3	3.6
Northern Plateau.							33.3	+1.0										78	1.55	−0.3										6.4	
Baker City	3,471	53	59	26.51	30.19	+.03	28.6	+0.1	42	8	35	6	26	22	24	26	22	76	1.62	−0.1	15	3,891	se.	21	w.	15	8	4	19	6.8	10.1
Boise	2,739	61	68	27.29	30.23	+.03	32.6	−0.6	56	29	40	9	27	25	29	29	25	76	1.71	−0.2	12	2,503	nw.	19	w.	25	11	8	12	5.7	6.3
Lewiston	757	10	51	29.28	30.12	−.01	37.8	+0.5	55	17	43	20	4	32	23	...	...	...	1.03	−0.3	16	4,625	e.	46	w.	15	8	8	15	6.5	0.2
Pocatello	4,483	46	54	25.54	30.20	+.01	28.8	+2.8	50	30	39	−11	27	19	33	25	20	72	1.36	−0.2	10	7,835	e.	38	sw.	15	13	7	11	4.9	16.4
Spokane	1,929	101	110	28.02	30.12	+.04	33.6	+2.3	47	19	38	18	26	29	18	32	30	85	1.80	−0.8	12	4,224	sw.	40	sw.	15	1	5	25	8.5	2.9
Walla Walla	1,000	71	79	29.03	30.13	+.01	38.6	+0.9	61	29	44	19	4	33	24	36	33	82	1.76	−0.4	14	4,366	s.	40	se.	29	7	10	14	6.2	2.4
N. Pac. Coast Reg.							43.6	+1.7										86	7.96	−0.5										8.4	
North Head	211	11	56	29.79	30.02	−.01	46.2	+2.4	57	29	50	35	25	42	14	44	42	88	9.34	−0.6	26	16,065	e.	85	se.	29	2	4	25	8.7	
Port Crescent	259	12	29	29.68	29.96	−.02	41.0	+1.6	56	29	46	28	26	36	17	...	...	...	8.14	+1.2	22	3,884	se.	37	s.	29	0	12	19	7.9	0.8
Seattle	123	114	151	29.91	30.05	+.04	43.9	+1.3	55	29	48	32	5	40	15	42	39	85	5.29	−0.8	21	3,095	se.	36	sw.	14	0	9	22	7.9	T.
Tacoma	213	113	120	29.80	30.03	+.02	42.7	+1.8	57	29	48	29	4	38	15	...	...	...	5.07	−2.3	21	4,913	sw.	37	sw.	14	0	9	22	8.2	T.
Tatoosh Island	86	7	57	29.83	29.93	−.03	45.2	+1.9	53	29	48	35	22	42	13	43	41	86	12.01	−2.4	26	17,623	e.	72	sw.	14	0	3	28	9.4	
Portland, Oreg.	154	68	96	29.91	30.07	.00	43.3	+2.0	55	18	48	28	7	39	17	41	38	81	7.14	−0.6	24	4,988	se.	28	sw.	14	3	5	23	8.5	T.
Roseburg	518	56	60	29.55	30.12	+.01	43.2	+1.2	62	29	48	29	22	38	17	41	39	88	8.72	+2.3	20	2,094	sw.	20	sw.	9	0	11	20	8.3	0.6
Mid. Pac. Coast Reg.							48.7	−0.1										81	3.54	−1.9										5.7	
Eureka	62	62	80	30.07	30.14	+.02	49.1	+0.5	61	8	55	33	26	43	20	46	43	81	8.18	+0.9	15	4,947	s.	41	n.	24	9	10	12	5.7	
Mount Tamalpais	2,375	11	18	27.64	30.14	+.02	46.2	...	67	20	51	32	25	42	17	41	36	75	2.92	...	11	14,581	nw.	58	se.	30	12	11	8	4.4	
Red Bluff	332	50	56	29.80	30.16	+.02	45.4	−1.3	62	3	52	32	6	38	27	42	38	82	3.81	−1.5	9	3,208	se.	24	se.	24	8	7	16	6.4	
Sacramento	69	106	117	30.09	30.16	+.02	45.7	−1.4	60	3	51	33	5	40	23	44	41	86	1.20	−2.9	8	5,054	se.	47	se.	24	5	7	19	7.1	
San Francisco	155	161	167	30.01	30.18	+.06	50.6	−0.8	61	13	55	38	20	46	13	48	45	82	1.59	−3.4	10	4,876	n.	38	s.	30	13	8	10	5.0	
Point Reyes Light	490	7	50	...	...	...	52.6	+2.7	65	19	57	42	17	48	19	...	...	...	2.93	−2.4	8	13,753	nw.	80	s.	30	10	8	13	5.7	
Southeast Farallon	30	9	17	30.10	30.13	...	54.0	...	61	9	57	45	22	51	8	...	...	...	2.22	...	10	11,431	nw.	58	s.	30	10	9	12	5.4	
S. Pac. Coast Reg.							55.0	+2.2										64	1.94	−1.1										4.2	
Fresno	330	67	70	29.80	30.16	+.03	46.0	−0.3	68	29	55	29	26	37	32	42	39	80	1.12	−0.4	2	2,927	nw.	19	nw.	24	7	5	19	7.0	
Los Angeles	338	116	123	29.70	30.07	.00	59.7	+4.3	86	19	70	39	26	49	34	49	38	53	2.45	−1.5	4	3,659	ne.	25	nw.	13	17	10	4	2.9	
San Diego	87	94	102	29.95	30.04	−.03	58.8	+3.0	78	19	66	44	26	51	25	51	43	63	2.46	+0.3	7	3,884	ne.	19	e.	6	21	5	5	2.5	
San Luis Obispo	201	47	54	29.90	30.12	+.01	55.4	+2.0	82	19	66	32	28	44	39	48	40	62	1.72	−2.8	2	4,732	n.	25	se.	30	15	6	10	4.2	
West Indies.																															
Basseterre	29	41	54																												
Grand Turk	11	6	20	30.03	30.04	+.03	73.2	...	78	*	76	57	23	71	19	...	...	...	1.45	...	9	...	e.	30	ne.	23	17	9	5	4.7	
Havana	57	87	105	30.01	30.07	+.03	72.0	+0.6	84	27	77	60	19	67	17	...	...	...	1.29	−0.9	5	8,191	e.	39	e.	22	16	8	7	4.2	
Kingston	286	41	55																												
San Juan	82	48	90	29.92	30.01	+.04	77.0	−0.7	85	19	83	70	21	71	14	71	69	81	1.94	−2.4	21	6,384	e.	28	e	24	15	16	0	3.8	

* More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, December, 1904.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Alaga				4.28	
Anniston	68	16	41.1	3.79	T.
Ashville	72	17	45.0	4.89	T.
Bermuda	77	21	49.6	3.62	
Boligee	74	20	47.2	3.97	
Bridgeport				5.14	
Burkeville				3.35	
Calera				4.66	
Camphill	68[j]	24[j]	48.2[j]	4.28	
Cedar Bluff				6.18	
Citronelle	77	27	53.2	3.99	
Clanton	80	20	45.9	2.75	
Cordova				4.59	
Dadeville				3.71	
Daphne	76	26	54.4	3.45	
Decatur	71	21	45.0	4.50	
Delmar	70	15	44.6	2.77	T.
Demopolis				4.08	
Eufaula	73	24	48.6	5.02	
Evergreen	74	24	49.4	2.78	
Flomaton	79	24	54.6	5.86	
Florence *a*				5.68	
Florence *b*	71	18	44.0	5.49	T.
Fort Deposit	73	25	48.9	2.78	
Gadsden	70	20	45.5	4.82	
Goodwater	70	18	44.9	3.14	T.
Greensboro	73	22	47.8	3.77	
Greenville				2.53	
Guntersville				5.34	T.
Hamilton	72	19	45.5	4.06	T.
Letohatchie				2.93	
Livingston	74	21	44.2	4.33	
Lock No. 4	71	19	45.8	4.24	
Lucy	80	20	52.0	2.02	
Madison Station	73	15	44.1	5.54	0.5
Maplegrove	72	18	43.8	4.21	T.
Marion	72	22	46.9	4.02	
Milstead				5.98	
Newbern	77	20	48.1	4.27	
Notasulga				1.52	
Oneonta	70	17	42.8	4.85	T.
Opelika	70	22	51.4	3.80	
Ozark	79	24	50.8	5.61	
Prattville	77	20	47.2	3.21	
Pushmataha	83	20	49.8	5.55	
Riverton	70	15	43.6	7.58	T.
Scottsboro	70	16	45.2	5.35	
Selma	74	24	48.3	4.10	
Spring Hill	73	30	52.2	3.47	
Talladega	76	17	43.6	3.79	2.4
Tallassee				4.78	
Thomasville	74	24	47.9	3.93	
Tuscaloosa	72	21	45.0	4.76	
Tuscumbia	70	20	43.0	5.73	T.
Tuskegee	75	22	50.0	4.57	
Union Springs	79	24	48.8	5.50	
Uniontown	77	18	46.7	3.44	
Valleyhead	66	16	43.1	5.01	1.6
Vienna				5.77	
Wetumpka	76	21	49.0	5.03	
Alaska.					
Killisnoo	53	16	36.3	8.55	1.0
Loring	54	15	38.2	20.01	14.0
Sitka	51	24	39.0	8.13	4.5
Arizona.					
Allaire Ranch				0.79	T.
Arizona Canal Co. Dam	80	35	55.3	0.57	
Aztec	85	30	57.0	T.	
Benson	72	22	46.8	1.17	
Bisbee	62	25	45.3	1.33	T.
Blue	64	13	36.8	2.06	2.5
Bowie		25		2.05	
Buckeye	78	24	50.6	0.17	
Casagrande	81	28	52.4	0.63	
Champie Camp	82	17	49.6	0.40	
Cochise *[1]	58	22	42.0	0.30	
Congress	71	31	52.8	0.22	
Douglas	74	20	45.8	1.09	
Dragoon *[1]	80	32	46.9		
Dudleyville	76	26	49.0	1.73	T.
Duncan	70	16	41.6	1.83	T.
Fort Apache	69	10	38.3	1.75	
Fort Defiance	56	−7	26.2	0.87	5.2
Fort Grant	70	25	45.9	0.16	
Fort Huachuca	79	26	46.4	0.70	T.
Fort Mohave	78[j]	18	48.0[e]	0.21	
Gilabend	88	31	56.8	0.00	
Grand Canyon	52	0	27.2	0.60	6.0
Greaterville	68	24	45.6	1.30	0.5
Greer				1.40	9.0
Holbrook	66	4	34.7	0.10	T.
Jerome	63	22	44.3	0.60	
Kingman	66	25	45.8	0.27	
Maricopa	75	25	49.6	0.35	
Mesa	80	28	52.6	1.01	
Mohawk Summit *[1]	77	42	57.0	0.00	
Natural Bridge				1.05	
Oracle	69	27	47.4	2.47	
Arizona—Cont'd.					
Oro				2.45	
Parker	80	21	51.4	0.07	
Phoenix	77	26	51.2	0.30	
Pinal Ranch				2.18	
Prescott	69	4	38.1	0.40	T.
St. Johns	68[g]	21[g]	42.4[g]	0.95	
San Carlos	75	22	46.4	1.44	T.
San Simon	77	18	42.7	1.30	
Seligman	64	11	38.0	0.61	T.
Sentinel *[1]	76	32	54.5	0.00	
Signal				0.49	
Superstition				1.40	
Taylor	60	5	32.6	0.46	3.5
Thatcher	73	19	44.7	2.16	
Tombstone	67	26	46.0	0.74	
Tucson	78	28	47.8	0.93	
Upper San Pedro	72	18	44.3	T.	
Vail *[5]	77	33	55.3	0.16	
Wilcox	68	16	41.9	0.75	
Williams	59	7	35.4	0.67	5.5
Yarnell				0.50	
Young	73	12	41.1	0.52	
Arkansas.					
Amity	78	16[j]	43.4[e]	4.67	1.5
Arkadelphia	74[e]	18[e]	43.9[e]	8.02	4.0
Arkansas City				9.10	
Batesville	69	14	41.5	2.92	
Beebranch	78	12	42.8	2.95	
Black Rock				2.68	T.
Blanchard Springs	74	23	46.2	7.82	
Brinkley	70	19	43.4	9.46	T.
Calico Rock				1.07	
Camden *a*				9.04	
Camden *b*	75	22	44.4	9.47	T.
Conway	72	13	44.4	3.51	4.0
Corning	68	12	37.8	2.46	1.4
Dallas	76	14	44.4	2.94	0.5
Dardanelle				2.83	1.0
Des Arc	71	16	43.8	6.33	1.0
Dodd City	69	9	38.8	1.12	0.2
Dutton	67	3	38.6	1.29	1.1
Eldorado	75	24	45.8	10.67	
Elon	76[f]	22[f]	47.1[f]	10.93	
Eureka Springs	70	8	39.8	1.03	0.8
Forrest City	70	17	42.4	6.81	
Fulton				3.01	
Hardy	72	10	41.3	1.29	1.2
Heber	71	12	42.2	4.29	T.
Helena *a*				9.10	
Helena *b*	72	19	43.8	9.27	0.5
Hope	78	21	47.2	6.71	0.2
Howe	75	18	46.2	4.31	T.
Jonesboro	69	14	42.8	5.97	0.2
Lacrosse	70	10	39.5	1.74	T.
Lake Village	76	23	45.9	10.75	T.
Lonoke	70	17	43.8	4.53	1.0
Lutherville	80	9	45.4	1.90	0.2
Luxora				4.22	T.
Malvern	73	16	43.0	6.35	1.0
Mammoth Springs	72	9	36.8	0.62	T.
Marked Tree				5.63	T.
Marvell	72	19	44.5	9.36	1.2
Mossville	68	4	39.0	2.91	0.1
Mount Nebo	69	9	43.0	2.54	0.5
New Gascony				9.35	1.0
New Lewisville	77	22	47.0	4.14	
Newport *a*				4.06	T.
Newport *b*	70	14	41.2	4.18	T.
Oregon	77	4	38.5	1.02	0.5
Osceola	70	19	43.8	5.70	T.
Ozark	73	12	42.0	1.83	0.5
Perry	71	5	42.4	2.40	2.5
Pinebluff	73	18	42.9	8.38	2.0
Pocahontas	68	11	41.0	2.73	0.7
Pond	69	3	38.6	0.76	0.5
Prescott	76	20	44.2	7.22	0.2
Princeton	74	17	43.6	6.43	
Russellville	70[g]	13[e]	36.1[e]	1.30	
Silversprings	69	6	39.7	0.94	1.3
Spielerville	74	14	42.4	1.27	0.2
Springbank				6.71	
Stuttgart	72	17	44.0	6.74	T.
Texarkana	76	18	51.4	5.30	
Warren	75	19	45.4	10.63	1.5
White Cliffs				3.42	0.4
Wiggs	71	12	42.4	4.04	2.0
Winchester	76	20	49.0	6.99	0.5
Witts Springs	58	9	37.5	1.34	1.0
California.					
Alturas				1.86	
Angiola	76	20	46.8	1.00	
Azusa	87	32	57.3	1.73	
Bagdad	75	35	52.5	T.	
Bakersfield	75	24	47.4		
Barstow	68	33	51.9	T.	
Bear Valley				8.89	23.0
Berkeley	59	32	46.4	2.03	
Bishop	73	15	41.2	0.10	
California—Cont'd.					
Blue Canyon	68	17	39.8	7.11	19.0
Boca *[1]	50	2	27.6	3.90	16.0
Bodie	58	−13	23.0	0.84	7.0
Bowman				12.66	32.0
Branscomb	79	25	45.6	13.80	
Brush Creek	56	24	40.9	12.92	0.5
Butte Valley				12.25	76.0
Caliente *[1]	60	32	44.8	1.35	
Cambria				1.84	
Campbell	65	28	46.4	2.39	
Campo				1.82	
Cedarville	54	5	31.3	2.28	10.0
Chico	57	28	45.0	3.99	
Chino *[5]	82	30	54.6	1.02	
Cisco *[1]	42	18	32.1	7.20	51.0
Claremont	87	32	57.6	1.23	
Cloverdale	68	31	48.4	7.88	
Colusa	60	30	45.2	2.91	
Corning *[1]	70	31	47.0	3.03	
Crescent City	60	32	48.5	15.39	
Crockers				4.95	5.0
Cuyamaca	56	18	37.0	2.95	T.
Delano *[1]	69	28	48.7	1.30	
Delta	70	32	49.3	6.38	
Dobbins	69	32	49.0	4.94	
Drytown	61	28	44.4	2.90	
Dunnigan *[1]	59	34	46.8	2.88	
Durham	62	26	45.0	4.78	
Elcajon	87	32	54.8	2.73	
Electra				2.94	
Elmwood	66	26	45.4	1.02	
Elsinore	80	26	52.0	0.91	
Escondido	80	22	49.1	1.68	
Folsom				1.98	
Fordyce Dam				10.30	62.0
Fort Bragg				5.84	
Fort Ross	60	35	49.4	9.91	
Foster				2.40	
Georgetown	67	30	45.2	5.57	T.
Gilroy (near)	70	24	48.2	1.45	
Greenville	57	8	35.0	9.07	21.0
Hanford	70	24	45.2	1.16	
Healdsburg	67	29	48.0	4.51	
Hollister	70	25	48.2	1.11	
Idylwild	70	20	43.2	0.98	T.
Iowa Hill *[1]	70	28	46.2	5.23	T.
Irvine				1.47	
Isabella	74	19	45.6	0.62	
Jamestown	63	28	44.0	3.38	
Jolon				1.63	
Kennedy Gold Mine				3.58	
Kentfield				4.98	
Kernville				0.72	
King City	78	22	50.0	1.45	
Le Grand	72	27	45.2	1.48	
Lemoncove	72	28	48.2	1.78	
Lick Observatory	65	15	43.0	3.84	11.0
Livermore	67	26	47.1	1.42	
Lodi	60	27	45.8	1.66	
Los Gatos	62	32	47.3	3.23	
Lowe Observatory				1.98	
Mammoth	85	29	56.0	T.	
Marysville	61	30	45.5	2.72	
Merced	67	26	46.2	1.15	
Mercury				8.52	
Mills College				1.81	
Milo				2.37	
Milton (near)	59	31	46.0	2.10	
Modesto *[1]	78	36	53.2	1.31	
Mohave	76	39	56.5	0.60	
Mokelumne Hill				2.83	
Montague	54	14	33.5	2.68	T.
Monterio	70	24	48.8	3.11	
Monterey *[1]	68	32	51.1	3.06	
Mount St. Helena				10.49	
Napa	64	30	47.4	2.40	
Needles	79	35	59.1	0.20	
Nellie				2.40	T.
Nevada City	73	22	43.8	5.90	0.5
Newcastle	59	40	49.6	2.50	
Newman	64	29	45.2	0.95	
Niles	62	32	48.5	2.13	
Nordhoff				3.10	
North Bloomfield	69	22	42.8	7.99	2.0
Oakland	59	36	49.0	1.52	
Ontario (near)	81	31	53.4	1.30	
Orland	61	30	44.8	3.40	
Orleans	67	30	47.8	13.07	
Oroville (near)	60	29	45.7	4.87	
Palermo	64	28	45.8	4.47	
Peachland	62	28	46.9	7.48	
Pilot Creek				8.11	10.5
Pine Crest	80	43	59.6	2.58	
Placerville	60	24	41.4	4.27	
Point Lobos	69	45	56.1	1.63	
Porterville	75	27	48.0	1.33	
Poway				1.85	
Quincy	50	17	34.6	9.04	4.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Redding	64	30	45.2	5.90	
Reedley	73	25	45.8	1.77	
Represa	60	30	46.4	2.03	
Riovista	59	31	45.4	1.45	
Riverside	83	28	53.1	1.11	
Rohnerville	.....	.....	.....	11.80	
Sacramento	58	30	46.3	1.46	
Salinas	75	29	50.8	1.35	
Salton	84	27	55.4	0.00	
San Bernardino	85	27	54.0	1.03	
San Jacinto	68	27	44.5	1.02	
San Jose	66	30	48.8	2.28	
San Leandro	60	31	46.6	1.68	
San Mateo*[1]	85	37	49.8	2.06	
San Miguel*[1]	66	24	47.3	0.96	
San Miguel Island	.....	.....	.....	1.09	
San Rafael	62	32	48.2	4.01	
Santa Barbara	82	41	58.4	1.53	
Santa Clara College	64	27	47.7	2.50	
Santa Cruz	71	30	49.2	2.11	
Santa Maria	79	33	54.8	1.55	
Santa Rosa	69	29	46.8	4.50	
Sausalito	.....	.....	.....	3.32	
Shasta	65	23	45.4	6.38	
Sierra Madre	82	40	57.4	1.56	
Sisson	55	8	34.2	4.95	
Snedden	.....	.....	.....	1.35	
Sonoma	.....	.....	.....	3.57	
Sonora	59	32	43.9	3.25	
Stockton	66	29	44.8	1.28	
Storey	67	23	44.0	1.08	
Summerdale	68	18	41.5	4.39	16.0
Summit	50	18	32.6	8.60	66.0
Susanville	49	3	31.3	4.10	14.0
Tehama*[1]	64	32	48.3	3.63	
Tejon Ranch	69	29	48.7	2.04	
Truckee	58	11	27.8	3.78	28.0
Tulare	82	24	46.6	1.42	
Tustin	.....	.....	.....	1.42	
Ukiah	64	26	45.4	8.31	
Upland	75	32	52.3	1.09	
Upperlake	64	21	42.6	5.69	
Vacaville	64	28	46.0	1.71	
Ventura	88	40	60.6	2.57	
Visalia	68	20	44.2	1.03	
Volcano	76	24	53.8	0.00	
Wasco	75	24	45.6	0.95	
Weldon	.....	.....	.....	0.55	
Westpoint	.....	.....	.....	3.92	
Wheatland	57	28	44.4	2.06	
Willow	62	31	48.0	3.10	
Yosemite	.....	.....	.....	3.63	11.5
Yreka	.....	.....	.....	5.44	.....
Zenia	68	18	42.6	12.68	T.
Colorado.					
Alford	65	0	30.0	0.01	0.2
Antelope Springs	44	−25	14.4	0.55	7.5
Ashcroft	46	−23	18.8	1.15	15.0
Blaine	70	− 3	32.8	0.93	12.0
Boulder	68	4	37.6	0.70	8.5
Boxelder	.....	.....	.....	0.12	1.0
Breckenridge	49	−21	18.7	1.72	30.0
Buena Vista	.....	.....	.....	0.20	2.0
Burlington	78	0	32.2	0.30	2.0
Canyon	66	−14	36.7	0.49	11.0
Cheesman	58	−12	30.4	0.29	3.5
Cheyenne Wells	69	− 2	33.2	0.29	4.5
Clearview	55	− 8	23.0	0.81	13.5
Collbran	54	−16	24.6	0.66	9.8
Colorado Springs	66	− 5	33.4	0.28	4.0
Conejos	52	−17	18.6	0.47	7.0
Cripplecreek	.....	.....	.....	0.43	9.3
Durango	55	−13	27.7	1.17	.....
Eagle	52	−29	20.4	0.69	11.8
Fort Collins	66	1	32.1	0.12	1.0
Fort Morgan	67	0	31.0	0.10	T.
Fowler	.....	.....	.....	0.82	8.0
Fox	73	1	33.9	0.25	2.0
Fruita	54	− 7	26.0	0.67	4.2
Garnett	50	−26	13.0	0.51	9.5
Gleneyre	68	−12	32.8	0.23	2.0
Glenwood	51	−22	23.2	0.83	11.0
Grand Valley	54	−12	26.4	0.80	7.8
Greeley	67	− 5	33.2	0.04	0.4
Grover	.....	.....	.....	T.	T.
Gunnison	53	−25	14.4	0.25	4.0
Halls Gulch	39	−19	14.0	1.17	23.8
Hamps	69	− 4	31.0	0.09	1.5
Hoehne	71	−21	30.0	0.43	5.6
Holly	72	0	30.6	0.80	9.0
Holyoke	74	− 4	33.2	0.06	1.0
Husted	65	−18	29.2	0.19	2.5
Lake Moraine	50	3	25.2	0.85	13.0
Lamar	73	− 2	31.2	1.30	13.0
Laporte	.....	.....	.....	0.13	1.8
Las Animas	71	− 7	31.8	0.23	2.0
Lay	53	−33	20.5	0.85	16.5
Leadville	47	−17	20.6	0.86	10.5
Colorado—Cont'd.					
Leroy	67	− 1	33.2	0.05	0.9
Longs Peak	52	− 6	24.4	0.94	12.5
Mancos	56	−15	28.4	0.88	14.2
Marshall Pass	.....	.....	.....	2.36	43.0
Meeker	54	−26	23.9	0.58	9.3
Montrose	59	−10	27.8	0.23	5.0
Pagoda	56	−22	25.9	0.93	11.0
Platte Canyon	.....	.....	.....	0.63	6.2
Rockyford	68	−12	33.0	0.31	7.5
Saguache	49	−11	18.2	0.34	5.0
Salida	57	− 7	28.4	0.50	7.5
San Luis	58	−11	22.6	0.17	2.5
Santa Clara	61[h]	2[h]	30.1[h]	.....	.....
Sapinero	48	−24	18.8	0.82	15.2
Sheridan Lake	68	4	31.4	0.25	3.8
Silt	53	−11	27.4	0.88	12.0
Silverton	47	−13	20.4	1.02	16.0
Sugar City	.....	.....	.....	0.20	.....
Sugar Loaf	55	− 6	28.9	0.73	11.0
Trinidad	79	− 5	39.2	0.84	12.0
Victor	52	−15	23.8	0.50	6.8
Vilas	.....	.....	.....	0.55	6.0
Wagon Wheel	52	−14	18.4	0.50	6.0
Walden	45	−33	19.3	0.31	5.2
Waterdale	57	1	27.4	0.43	5.0
Westcliffe	59	−17	24.4	0.39	5.0
Wray	73	0	34.8	0.20	2.0
Yuma	.....	.....	.....	0.27	3.0
Connecticut.					
Bridgeport	47	0	25.3	3.26	25.8
Canton	49	−18	19.8	2.96	16.0
Colchester	48	0	23.6	3.66	24.2
Falls Village	.....	.....	.....	2.58	16.4
Hartford *b*	45	− 1	22.8	3.11	18.5
Hawleyville	47	− 2	22.2	3.37	26.0
Lake Konomoc	.....	.....	.....	4.28	.....
New London	49	6	27.3	4.18	33.5
North Grosvenor Dale	48	−11	20.1	3.16	.....
Norwalk	46	− 5	22.2	2.78	27.7
Southington	48	− 8	22.2	2.80	21.0
South Manchester	.....	.....	.....	2.61	.....
Storrs	47	− 1	19.2	2.42	.....
Voluntown	53	−12	23.8	2.43	20.8
Wallingford	.....	.....	.....	4.33	29.6
Waterbury	48	− 7	22.7	3.28	28.5
West Cornwall	47	− 3	21.4	3.09	25.1
West Simsbury	.....	.....	.....	3.13	17.0
Delaware.					
Delaware City	.....	.....	.....	3.73	21.5
Milford	66	4	31.8	5.55	18.5
Millsboro	60	3	31.2	6.19	17.0
Newark	55	− 1	26.5	1.70	12.8
Seaford	60	2	30.4	6.07	15.5
District of Columbia.					
Distributing Reservoir*[5]	62	12	31.5	2.13	.....
Receiving Reservoir*[5]	61	12	31.0	2.64	.....
West Washington	60	6	30.0	3.58	14.5
Florida.					
Apalachicola	76	31	56.4	3.87	
Archer	79	26	55.4	2.32	
Avon Park	86	36	61.3	1.46	
Bartow	83	31	60.3	1.23	
Bonifay	78	25	53.4	3.39	
Brooksville	84	30	59.0	0.79	
Clermont	85	34	61.8	1.23	
De Funiak Springs	78	23	52.5	5.03	
Eustis	82	30	58.9	1.26	
Federal Point	80	32	56.8	1.19	
Fernandina	78	32	56.6	1.41	
Flamingo	86	44	69.6	1.00	
Fort Meade	.....	31	.....	0.66	
Fort Pierce	81	37	63.1	0.08	
Gainesville	81	26	56.3	2.32	
Grasmere	81	34	57.8	.....	
Huntington	85[d]	31[d]	58.1[d]	2.23	
Hypoluxo	82	41	66.4	0.30	
Inverness	82	27	56.3	1.18	
Jasper	.....	.....	.....	1.62	
Johnstown	80[d]	25[d]	54.7[d]	2.05	
Kissimmee	82	32	59.0	0.80	
Lake City	79	28	54.6	1.50	
Macclenny	.....	.....	.....	1.36	
Madison	81	28	55.6	1.82	
Malabar	85	35	60.8	1.45	
Manatee	83	35	60.7	1.40	
Marco	84	41	66.6	0.46	
Marianna	80	23	53.0	3.51	
Merritt Island	82	38	61.8	0.81	
Miami	85	44	68.1	0.40	
Middleburg	80	23	54.4	2.32	
Molino	81	20	52.2	6.17	
Myers	80	38	62.6	0.83	
New Smyrna	85	28	58.2	0.70	
Nocatee	84	33	61.5	1.10	
Ocala	82	27	57.4	1.07	
Orange City	86	25	58.4	0.68	
Orange Home	83	28	58.4	1.40	
Orlando	85	31	61.1	1.06	
Florida—Cont'd.					
Pinemount	82[e]	26[f]	55.4[f]	2.33	
Plant City	85	29	59.4	1.66	
Rockwell	79[g]	26[g]	54.8[g]	1.34	
St. Andrews	76	25	52.6	6.17	
St. Augustine	79	30	57.4	1.24	
St. Leo	82	31	59.3	2.12	
Stephensville	81	24	54.0	4.17	
Sumner	80	22	54.0	1.58	
Switzerland	79[l]	29[l]	55.6[l]	1.88	
Tallahassee	74	30	55.2	4.76	
Tarpon Springs	82	30	58.6	2.37	
Titusville	86	29	59.4	0.95	
Wausau	.....	24	.....	3.61	
Wewahitchka	82	26	53.4	5.53	
Georgia.					
Abbeville	.....	.....	.....	2.43	
Adairsville	70	19	43.8	5.66	T.
Albany	80	26	50.6	3.95	
Americus	73	25	48.8	4.16	
Athens	65	21	42.6	4.44	T.
Bainbridge	78	.....	.....	3.29	
Blakely	78	24	50.6	3.51	
Bowersville	66	21	42.6	4.40	1.3
Butler	.....	.....	.....	3.77	T.
Camak	73	24	48.8	3.50	
Carrollton	69	15	46.2	2.95	T.
Canton	.....	.....	.....	4.72	T.
Carlton	.....	.....	.....	4.05	0.2
Clayton	64	18	39.1	4.97	2.5
Columbus	75[g]	25[g]	47.4[g]	6.25	
Cordele	77	20	47.7	2.79	
Dahlonega	67	17	41.0	5.45	0.5
Dawson	76[d]	21[d]	51.4[d]	3.34	
Diamond	66	13	40.4	4.69	1.1
Dublin	.....	.....	.....	2.29	
Dudley	75	23	49.5	3.28	
Eastman	75	26	49.6	2.16	
Eatonton	71	23	46.4	4.29	
Elberton	68	21	44.1	4.37	
Experiment	69	22	46.6	3.18	0.5
Fitzgerald	80	20[e]	48.6	2.26	
Fleming	76	20	51.0	1.40	
Forsyth	72	23	47.8	5.20	
Fort Gaines	74	24	49.4	4.85	
Gainesville	69	22	42.4	1.88	0.8
Gillsville	65	22	43.8	3.70	T.
Glenville	75	25	49.2	1.48	
Greenbush	67	17	42.4	4.93	T.
Greensboro	73	20	44.8	4.35	
Griffin	70	22	45.0	3.95	.....
Harrison	73	20	48.6	3.84	
Hawkinsville	79	21	49.0	1.76	
Hephzibah	74	24	47.2	1.15	T.
Lost Mountain	70	19	43.9	3.30	0.1
Louisville	73	22	47.1	2.76	
Lumpkin	75	23	51.0	4.69	
Marshallville	73	26	48.4	3.92	T.
Mauzy	77[e]	23[e]	52.2[e]	2.78	
Milledgeville	73	25	45.0	4.39	
Millen	76[e]	.....	50.9[e]	2.11	
Montezuma	.....	.....	.....	4.25	
Monticello	72	24	46.2	4.83	
Morgan	75	23	48.6	3.92	
Newnan	75	21	45.0	3.44	.....
Point Peter	68	19	44.0	4.54	T.
Poulan	76	20	50.2	2.87	
Putnam	74	23	48.4	4.35	
Quitman	77	25	52.1	3.63	
Ramsey	68	17	45.0	5.36	T.
Resaca	.....	.....	.....	4.92	
Rome	69	19	43.9	5.52	T.
St. Marys	77	24	53.0	0.87	
Statesboro	76	24	50.9	1.25	
Talbotton	74	20	48.1	6.19	T.
Tallapoosa	69	19	44.3	2.93	
Thomasville	80	26	52.8	3.64	
Toccoa	64	19	40.8	4.59	.....
Valona	77	23	52.6	0.89	
Vidalia	78	27	51.8	1.72	
Washington	69	22	44.2	4.55	T.
Waverly	83	21	52.8	0.87	
Waycross	79	25	51.8	1.28	
Waynesboro	73	24	48.5	1.95	
Westpoint	71	19	47.2	3.02	
Woodbury	68	17	44.3	3.94	
Idaho.					
Albion	54	− 5	29.9	1.29	10.00
American Falls	48	−20	24.6	1.26	.....
Blackfoot[g]	45	−25	24.1	.....	
Blue Lakes	60	0	34.5	0.67	4.5
Caldwell	47	11	31.2	1.57	0.9
Cambridge	51	−14	25.5	4.15	31.4
Chesterfield	49	−35	21.0	1.61	22.0
Dewey	50	−10	28.0	2.42	20.7
Ditto Creek	52	0	32.6	1.42	12.7
Forney	50	−12	22.8	2.90	20.5
Garnet	55	11	34.1	0.32	
Grangeville	51	6	32.6	2.35	15.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Idaho—Cont'd.					
Idaho City	51	−15	27.0	2.93	......
Idaho Falls	50	−23	24.1	0.78	11.0
Lake	26	−16	10.4	0.70	7.0
Lakeview	49	18	33.7	3.30	......
Landore	......	......	......	4.72	46.4
Lost River	45	−16	23.0	0.21	2.1
Lovell	54[d]	14[d]	33.7[d]	4.45	24.4
Malad City	53	10	27.8	0.25	......
Milner	58	− 6	29.6	0.45	3.5
Moscow	57	11	33.2	1.25	4.5
Murray	44	4	28.8	3.62	15.0
Oakley	54	0	29.2	0.30	3.0
Ola	46	−11	28.6	4.63	19.8
Paris	50	−25	23.6	1.08	12.7
Payette	52	9	31.6	2.29	1.0
Pollock	52	14	35.8	2.43	20.1
Poplar	......	......	......	1.57	......
Porthill	47	9	31.5	1.83	17.0
Roosevelt	47	− 8	23.0	5.40	56.0
St. Maries	47	12	33.8	2.27	6.2
Soldier	48	−20	18.8	1.45	22.0
Vernon	53	−20	23.0	1.01	10.1
Victor	48	−21	21.6	1.50	15.0
Weston	51	−22	25.2	0.99	15.0
Illinois.					
Albion	60	7	33.2	3.28	5.5
Aledo	57	− 4	26.2	1.75	6.1
Alexander	59	1	30.1	0.68	4.2
Antioch	50	− 9	22.0	1.30	6.0
Ashton	53	−18	22.4	2.71	12.4
Astoria	56	0	28.4	1.90	5.0
Aurora	52	− 5	24.6	1.69	8.3
Benton	64	9	35.9	2.76	5.5
Bloomington	55	1	28.9	1.53	4.5
Bushnell	57	− 2	28.4	1.05	5.0
Cambridge	53	− 4	26.6	2.14	8.7
Carlinville	66	1	32.2	1.02	7.0
Carrollton	62	− 1	32.2	1.20	6.0
Charleston	57	− 5	31.3	1.84	3.2
Chester	......	......	......	2.20	4.2
Cisne	61	6	34.1	2.63	6.5
Coatsburg	60	− 3	28.0	1.67	1.5
Cobden	63	11	37.2	2.55	3.0
Colchester	59	0	29.4	1.45	6.5
Danville	......	......	......	1.23	......
Decatur	62	2	30.6	1.84	7.3
Dixon	55	−13	21.6	2.17	11.5
Effingham	58	4	32.0	2.28	8.0
Equality	64	11	37.6	2.66	1.5
Flora	59	6	32.1	2.15	6.5
Friendgrove	60	8	33.4	3.42	4.5
Galva	55	− 4	24.1	1.96	6.0
Grafton	......	......	......	1.84	8.5
Greenville	60	3	32.3	1.84	5.5
Griggsville	62	0	31.6	1.02	10.2
Halfway	60	11	35.8	2.81	3.5
Havana	57	− 1	29.7	1.26	2.5
Henry	54	− 6	26.4	1.71	5.5
Hillsboro	60	2	33.4	......	......
Hoopeston	54	0	27.3	1.35	6.0
Joliet	56	4	26.4	1.63	5.3
Kishwaukee	53	−21	22.7	1.93	1.9
Knoxville	53	− 4	26.0	1.77	3.0
Lagrange	53	− 2	24.7	0.99	8.0
Laharpe	57	0	27.7	1.92	4.5
Lanark	45	−20	21.7	2.65	14.7
Loami	......	......	......	0.68	4.8
McLeansboro	60	9	34.9	3.17	2.2
Martinsville	54[e]	5[e]	29.6[e]	......	......
Martinton	58	0	27.0	1.85	4.5
Mascoutah	59	4	32.0	1.52	4.0
Mattoon	64	4	34.2	0.83	2.1
Minonk	56	− 3	25.9	1.43	4.0
Monmouth	56	− 4	26.1	1.67	4.6
Morrison	56	−14	24.0	2.81	11.7
Morrisonville	62	2	31.2	1.20	7.0
Mount Carmel	......	......	......	3.66	7.0
Mount Pulaski	57	2	29.8	1.03	4.0
Mount Vernon	64	7	34.4	3.10	7.0
New Burnside	68	10	36.4	3.20	3.4
Olney	61	6	33.2	4.02	10.6
Ottawa	55	− 3	26.9	1.86	6.7
Palestine	59	6	31.6	4.48	......
Pana	57	3	31.0	1.34	4.5
Paris	57	5	31.0	2.26	......
Peoria *a*	......	......	......	1.30	5.7
Peoria *b*	54	3	31.0	1.33	......
Philo	59	3	28.0	0.76	3.5
Plumhill	61	6	34.0	0.81	1.5
Pontiac	57	− 1	27.8	2.14	5.0
Rantoul	55	2	28.0	1.25	4.5
Raum	65	9	36.6	3.58	3.2
Riley	49	−14	22.4	1.35	8.6
Robinson	58	5	32.4	4.50	6.5
Rushville	59	0	30.4	2.09	3.5
St. Charles	58	− 8	23.6	2.25	12.5
St. John	63	8	35.8	2.96	3.0
Shobonier	67	4	34.2	1.35	6.5
Illinois—Cont'd.					
Streator	57	− 5	27.0	1.57	......
Sullivan	59	3	30.6	1.06	4.8
Sycamore	52	− 9	21.8	2.16	10.0
Tilden	62	6	34.0	1.66	3.8
Tiskilwa	52	− 4	24.7	1.90	5.9
Tuscola	57	4	28.0	0.87	4.0
Urbana	55	2	27.7	0.83	7.5
Walnut	54	− 6	26.2	2.18	5.6
Winchester	59	1	31.0	0.95	4.2
Windsor	60	3	31.0	1.23	3.2
Winnebago	52	15	21.8	3.34	15.0
Yorkville	53	− 8	23.7	2.18	4.8
Zion	54	−13	23.0	2.25	......
Indiana.					
Anderson	59	− 1	27.6	4.16	2.6
Angola	56	− 4	24.9	1.83	14.5
Auburn	53[c]	−12[c]	23.6[c]	1.17	......
Bloomington	62	7	32.2	6.10	8.0
Butlerville	60	6	31.3	4.38	10.7
Cambridge City	59	− 6	25.6	5.10	8.3
Columbus	66	1	30.8	4.33	7.0
Connersville	59	− 2	27.8	5.04	7.0
Crawfordsville	53	− 4	29.2	......	......
Delphi	57	− 2	26.0	2.18	4.8
Farmersburg	58	0	30.3	4.68	5.5
Farmland	60	− 3	28.4	3.94	5.7
Franklin	60	3	30.2	4.74	6.4
Greencastle	56	5	29.0	4.57	5.8
Greenfield	60	4	29.4	5.00	3.5
Greensburg	59	0	29.9	1.73	9.5
Hammond	48	1	26.1	2.06	7.0
Hector	57	− 7	25.6	4.15	6.0
Holland	62	9	35.8	4.21	6.2
Huntington	54	− 1	24.7	2.84	6.0
Jeffersonville	62	13	35.6	4.01	3.0
Kokomo	58	− 2	26.8	......	......
Lafayette	55	3	27.4	2.30	4.5
Laporte	58	1	25.4	1.40	6.8
Logansport	56	3	26.6	1.49	0.9
Madison *a*	63	10	33.8	3.36	4.0
Madison *b*	......	......	......	2.88	......
Marengo	64	9	33.5	4.07	4.7
Marion	58	− 1	26.6	3.55	5.2
Markle	59	− 3	25.8	3.40	3.5
Mauzy	59	− 5	27.2	5.73	10.5
Moores Hill	58	5	30.5	3.99	8.8
Mount Vernon	63	9	34.2	4.25	4.5
Northfield	57	− 7	26.2	3.50	2.0
Paoli	61	6	32.4	4.37	7.0
Princeton	62	8	34.6	3.20	5.0
Rensselaer	57	2	26.8	2.39	2.8
Richmond	60	− 7	27.1	4.03	4.5
Rochester	54	0	26.6	1.35	2.3
Rockville	56	4	29.8	1.97	1.0
Rome	68	12	36.3	4.56	6.0
Salem	61	7	33.2	3.98	10.0
Scottsburg	62	11	34.9	3.78	6.0
Seymour[f]	60	0	30.6	3.90	9.5
Shelbyville	60	0	28.2	4.94	4.5
South Bend	54	− 3	23.6	1.79	6.0
Syracuse	53	− 4	25.4	1.19	3.0
Terre Haute	66	7	32.7	3.39	4.0
Topeka	70	−10	23.8	......	2.0
Valparaiso	55	4	26.4	1.43	......
Veedersburg	......	......	......	1.83	4.0
Vevay	64	9	33.9	4.00	7.0
Vincennes	61	7	32.9	3.78	7.0
Washington	62	7	32.4	3.92	5.2
Winamac	55[f]	0[f]	27.2[f]	2.06	2.5
Worthington	62	7	33.8	4.77	6.5
Indian Territory.					
Ardmore	72	17	42.4	0.45	T.
Calvin	......	......	......	0.84	0.5
Chickasha	74	12	42.1	0.20	2.0
Durant	74	17	44.8	0.82	
Fairland	71	3	38.5	1.52	2.0
Fort Gibson	......	......	......	0.38	
Goodwater	72	11	43.4	2.77	T.
Hartshorne	75	17	45.2	1.28	0.2
Healdton	74	11	43.0	0.62	
Holdenville	74	14	42.6	0.80	4.0
Marlow	74	8	40.2	0.30	0.8
Muskogee	72	11	40.3	0.59	
Okmulgee	75	13	41.2	0.79	T.
Pauls Valley	74	9	41.0	0.73	0.8
Ravia	76	16	45.1	0.41	0.2
Roff	72	9	44.3	0.50	
South McAlister	73	15	44.4	0.21	1.5
Tulsa	......	......	......	0.43	1.7
Vinita	71	3	37.8	1.21	4.0
Wagoner	71[g]	20[g]	35.8[g]	0.52	2.7
Webbers Falls	69	10	39.5	0.40	
Iowa.					
Afton	57	− 8	25.6	2.30	23.0
Albia	61	− 6	23.5	1.17	14.5
Algona	52	−10	19.6	1.37	12.0
Allerton	61	− 7	26.4	1.23	11.6
Alta	56	−12	21.6	0.52	5.0
Iowa—Cont'd.					
Amana	53	−13	23.4	1.62	13.9
Ames	53	− 6	22.2	0.79	8.5
Atlantic	64	− 9	24.8	1.05	10.5
Audubon	60	− 8	23.2	0.45	7.2
Baxter	54	− 8	23.4	1.40	15.0
Bedford	63	− 8	26.4	0.70	3.8
Belleplaine	50	−14	21.4	3.15	3.5
Bonaparte	58	− 2	26.6	2.25	4.0
Boone	54	− 7	24.3	1.65	18.1
Britt	50	−10	19.3	0.83	8.3
Buckingham	......	......	......	1.99	22.8
Burlington	57	− 2	28.1	2.48	......
Carroll	59	−11	22.9	1.45	14.5
Cedar Rapids	55	−11	21.8	1.75	20.0
Chariton	60	− 7	25.8	1.20	8.0
Clarinda	65	− 7	24.0	0.88	10.3
Clearlake	45	−12	20.8	1.40	14.0
Clinton	52	− 7	24.1	2.85	10.0
College Springs	66	− 7	27.4	0.83	8.3
Columbus Junction	56	− 3	26.1	2.54	7.8
Corning	62	− 8	24.3	......	......
Corydon	61	− 6	26.6	1.39	14.0
Cresco	43	−13	19.8	1.26	14.5
Cumberland	......	......	......	1.20	12.0
Decorah	45	−12	21.2	1.74	16.0
Delaware	45	−10	20.1	1.77	17.0
Denison	59	−10	24.4	0.62	......
Desoto	59	−14	25.2	2.30	23.0
Dows	50	−12	20.8	1.97	19.0
Earlham	60	−16	22.5	1.29	15.0
Elkader	48	−19	20.6	2.30	24.5
Estherville	56	−10	18.8	0.62	11.8
Forest City	47	−10	18.2	0.70	7.0
Fort Dodge	53	− 6	20.6	1.00	10.0
Fort Madison	......	......	......	1.78	7.0
Galva	56	−11	22.8	0.32	3.3
Gilman	......	......	......	2.07	20.0
Glenwood	64	− 7	28.4	0.20	2.0
Grand Meadow	46	−16	19.0	1.75	15.5
Greene	47	− 8	20.3	1.34	20.0
Greenfield	59	− 9	24.6	1.26	13.6
Grinnell	55	− 5	24.2	2.68	17.0
Grundy Center	50	−11	21.5	1.73	21.0
Guthrie Center	60	− 9	24.8	1.14	......
Hampton	51	−10	21.4	1.86	23.8
Hanlontown	48	−10	19.6	1.40	14.0
Harlan	60	−11	25.5	0.60	7.5
Hopeville	59	− 8	25.3	1.33	......
Humboldt	54	− 8	23.0	0.78	7.0
Independence	45	−12	19.8	2.10	21.0
Indianola	60	− 9	25.8	1.57	15.8
Inwood	58	−15	21.0	0.35	3.5
Iowa City	55	− 7	22.4	1.96	11.0
Iowa Falls	48	−11	20.4	1.85	18.0
Keosauqua	59	− 4	24.7	2.24	6.5
Knoxville	60	− 6	26.7	2.00	19.0
Lacona	......	......	......	1.61	14.0
Larrabee	58	−12	21.6	0.63	4.9
Leclaire	......	......	......	1.67	8.0
Lemars	57	−12	23.0	0.15	1.7
Lenox	62	−10	24.9	0.80	8.0
Leon	59	− 6	26.4	1.70	17.0
Little Sioux	60	− 9	25.6	0.07	0.7
Logan	56	− 6	25.4	0.60	6.0
Maple Valley	......	......	......	0.40	4.0
Maquoketa	54	−17	21.3	1.74	13.5
Marshalltown	52	− 9	20.0	2.59	......
Mason City	44	− 8	21.2	1.62	16.2
Massena	60	− 9	24.8	0.71	8.5
Mountayr	65	− 8	26.8	1.97	22.0
Mount Pleasant	57	− 3	26.3	3.34	7.7
Mount Vernon	53	− 8	22.8	2.10	17.0
Muscatine	......	......	......	2.12	1.5
New Hampton	46	−11	20.6	2.22	......
Newton	52	− 7	23.2	3.68	28.0
Northwood	44	−10	18.6	1.01	10.1
Odebolt	57	−11	24.0	0.65	6.5
Ogden	58	− 8	24.3	1.20	12.0
Olin	53	−12	22.8	2.00	11.0
Onawa	59	− 9	25.3	0.42	2.2
Osage	41	−10	19.4	2.29	22.9
Oskaloosa	59	− 4	25.1	1.09	12.5
Ottumwa	61	− 1	27.2	1.52	15.2
Pacific Junction	63	− 6	25.6	0.58	5.7
Perry	58	−10	[illegible]4.0	1.35	13.5
Plover	54	− 8	20.6	0.69	5.5
Pocahontas	55	− 8	22.5	0.78	7.8
Redoak	62	− 5	28.2	0.94	11.0
Ridgeway	49	− 8	22.7	2.75	16.9
Rock Rapids	58	−12	21.2	......	......
Rockwell City	55	−10	23.2	0.71	7.6
Sac City[g]	64	−10	27.5	......	......
St. Charles	61	− 6	26.9	2.44	22.9
Sheldon	61[c]	−13[c]	22.6[c]	0.46	5.8
Sibley	58	−12	18.4	0.50	5.0
Sioux Center	58	−13	21.5	0.60	6.0
Stockport	59	− 1	27.4	2.08	9.0
Storm Lake	56	−13	20.7	0.06	0.8

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
***Iowa*—Cont'd.**	°	°	°	*Ins.*	*Ins.*
Stuart	57	— 7	25.3	......	......
Thurman	65	— 5	26.6	0.40	4.5
Tipton	54	— 4	25.2	2.06	13.0
Toledo	54	—13	22.2	1.58	20.5
Vinton	50	—18	23.4	1.60	16.0
Wapello	56	0	27.2	2.27	7.0
Washington	56	4	26.2	2.01	......
Washta	......	......	......	0.30	3.0
Waterloo	49	—14	22.4	2.66	23.0
Waukee	59	—12	26.2	1.90	17.5
Waverly	47	—11	20.7	2.40	21.8
Westbend	54	— 8	21.3	1.30	12.5
Whatcheer	63[1]	— 2[1]	29.2[1]	......	10.0
Whitten	46	—10	21.0	2.30	23.0
Wilton Junction	55	— 6	24.8	2.28	......
Woodburn	......	......	......	1.50	15.5
Zearing	51	— 8	22.1	1.60	21.8
Kansas.					
Abilene	......	......	......	0.16	1.0
Achilles	72	— 3	31.5	0.47	4.7
Alton	68	— 3	30.5	1.02	8.2
Anthony	......	......	......	0.95	9.5
Atchison *a*	65	— 1	31.6	0.62	5.4
Baker	67	— 2	26.5	0.87	7.0
Burlington	67	1	33.6	0.60	5.0
Chapman	65	— 3	30.7	0.22	2.2
Clay Center	66	— 1	27.6	0.40	2.5
Coffeyville	72	6	40.0	1.24	10.0
Colby	73	— 2	32.0	0.56	6.0
Columbus	66	3	34.9	1.52	5.6
Cunningham	65	— 6	31.6	0.37	3.7
Dresden	71	1	32.6	0.66	5.8
Eldorado	68	0	33.8	0.27	2.7
Ellinwood	69	3	31.0	0.93	9.0
Ellsworth	68	0	31.0	0.56	3.5
Emporia	67	1	32.4	0 80	8.0
Englewood	75	0	33.2	1.05	9.5
Enterprise	67	— 4	28.6	0.38	3.5
Eureka	......	......	......	0.30	0.7
Fall River	67	5	33.6	0.62	6.3
Farnsworth	72	3	31.5	0.54	5.7
Forsha	65	— 2	32.6	0.25	2.5
Fort Leavenworth	66	— 2	32.8	1.20	12.0
Fort Scott	68	1	34.4	0.78	4.6
Frankfort	66	— 2	29.2	0.75	7.5
Garden City	71	— 4	29.4	1.30	13.0
Gove*[1]	79	4	30.2	0.55	5.5
Grenola	66	4	32.6	0.40	4.0
Harrison	60	— 4	27.8	0.16	1.4
Horton	66	— 1	30.1	0.61	6.0
Hoxie	68	— 1	33.1	0.50	5.0
Hugoton	70	3	30.3	0.80	8.0
Hutchinson	67	— 2	30.6	0.50	5.1
Independence	71	5	35.6	0.69	3.0
Jola	......	......	......	0.33	3.2
La Crosse	69	0	29.5	0.61	7.0
Lakin	68	— 3	29.4	1.00	10.0
Larned	75	— 1	30.0	0.85	8.5
Lebanon	58[c]	— 2[c]	27.4[c]	0.40	4.0
Lebo	67	0	31.8	0.43	4.3
Macksville	69	— 8	30.1	1.09	10.7
McPherson	67	0	29.8	0.33	2.5
Madison	66	3	32.0	0.85	8.5
Manhattan *b*	69	0	31.4	0.58	3.4
Manhattan *c*	70	0	29.7	0.53	5.3
Marion	64	0	32.0	0.30	3.0
Medicine Lodge	69	4	33.2	0.58	6.0
Moran	66	1	34.2	0.14	1.4
Mounthope	66	6	35.6	0.50	5.0
Ness City	67[g]	3[g]	28.8[g]	0.80	8.0
Newton	67	— 5	30.3	0.05	0.5
Norton	71	0	30.4	0.35	3.5
Norwich	67	2	53.6	0.50	5.0
Oberlin	......	......	......	0.65	5.0
Osage City	66[d]	0[d]	32.0[d]	0.47	4.7
Osborne	......	......	......	0.50	5.0
Oswego	77	4	36.9	1.33	4.5
Ottawa	67	0	32.6	0.48	2.7
Phillipsburg	71	1	30.0	0.43	4.3
Pleasanton	67	2	34.8	0.83	3.5
Pratt	69	2	31.7	0.63	6.3
Republic	61	— 3	27.8	0.20	2.0
Rome	70	0	34.2	0.75	7.5
Russell	67	0	30.3	0.61	6.4
Salina	66	0	31.2	0.53	5.3
Sedan	69	7	34.2	0.65	6.5
Toronto	67	0	31.0	1.50	4.8
Ulysses	72	— 3	31.4	1.20	12.0
Valley Falls	67	— 1	31.2	0.72	7.9
Viroqua	73[1]	3[1]	35.8[1]	0.80	8.0
Wakeeney	69[d]	1[d]	31.8[d]	0.65	6.5
Wakeeney (near)	......	......	......	0.65	6.5
Wallace	74	1	33.2	0.59	6.0
Walnut	66	3	35.6	0.26	1.6
Wamego*[1]	66	0	30.8	0.45	4.5
Winfield	67	4	33.4	1.00	5.2
Yates Center	70	4[e]	33.2	0.72	7.5
Kentucky.	°	°	°	*Ins.*	*Ins.*
Alpha	72	11	40.6	4.85	0.5
Anchorage	67	10	33.8	3.96	5.5
Bardstown	65	10	37.2	4.96	......
Beattyville	68	13	34.9	3.37	0.2
Beaver Dam	65	12	37.1	5.06	T.
Berea	68	8	35.7	3.20	1.2
Blandville	66	13	37.4	3.93	1.2
Bowling Green	65	13	39.0	5.40	0.2
Burnside	67	13	38.8	4.15	1.0
Cadiz	65	15	39.6	5.52	T.
Calhoun	65	10	39.0	4.51	T.
Catlettsburg	67	5	36.1	3.32	8.0
Earlington	65	12	37.2	4.82	T.
Edmonton	65	9	38.0	4.98	0.6
Eubank	64	11	34.6	3.53	0.6
Falmouth	......	......	......	4.14	8.0
Farmers	65	— 2	33.6	3.21	4.5
Frankfort	62	12	36.0	4.26	0.5
Franklin	68	15	38.9	4.60	T.
Greensburg	66	11	36.3	4.67	T.
Highbridge	65	10	36.6	3.39	T.
Hopkinsville	66	12	38.6	6.44	T.
Irvington	64	12	37.0	4.19	1.8
Jackson	72	14	39.8	3.12	T.
Leitchfield	64	10	36.6	5.14	5.0
Loretto	65	15[c]	39.5[c]	5.25	0.5
Manchester	67	11	36.8	3.62	T.
Mayfield	65	15	39.0	4.19	0.5
Maysville	65	3	32.4	3.41	10.6
Middlesboro	68[e]	14[e]	38.6[e]	5.20	......
Mount Sterling	64	10	34.6	3.92	2.0
Owensboro	63	13	38.4	4.04	T.
Owenton	60	7	31.6	4.69	5.0
Paducah *a*	......	......	......	3.74	......
Paducah *b*	68	16	39.6	4.38	0.5
Princeton	64	13	38.8	6.04	T.
Richmond	65	9	35.9	3.25	......
St. John	63	10	34.6	5.46	1.1
Scott	60	5	31.8	4.08	8.1
Shelby City	66	6	35.0	3.98	2.0
Shelbyville	65	10	33.0	3.56	7.0
Taylorsville	65	10	35.7	4.26	2.2
Williamsburg	68	10	40.0	4.00	0.5
Williamstown	62	7	33.4	3.79	7.6
Louisiana.					
Abbeville	78	26	52.6	3.50	
Alexandria	82	23	49.6	4.62	
Amite	78	23	50.0	5.27	
Baton Rouge	83	18	52.0	4.57	
Burnside	79	23	53.0	2.95	
Calhoun	77	21	46.8	9.79	
Cameron	66[g]	24	52.7[d]	2.67	
Caspiana	79	25	50.2	12.98	
Cheneyville	78	22	47.2	.....	
Clinton	78	24	50.9	4.97	
Collinston	76	23	47.0	13.40	
Covington	77	23	50.0	2.51	
Donaldsonville	83[b]	28[c]	55.1[f]	2.80	
Emilie	80	26	52.8	2.69	
Farmerville	77	......	......	10.87	
Franklin	81	27	52.9	2.76	
Georgetown	80	20	49.8	5.26	
Grand Coteau	79	26	52.8	3.67	
Hammond	76	24	51.7	4.82	
Houma	78	24	52.1	3.19	
Jennings	79	26	51.8	4.17	
Lafayette	77	25	51.1	5.09	
Lake Charles	80	......	......	3.90	
Lakeside	80	27	52.7	4.38	
Lawrence	79	30	55.2	2.16	
Leesville	80	20	50.2	8.10	
Libertyhill	81	21	48.6	14.09	
Logansport	......	......	......	10.60	
Mansfield	74[d]	18[d]	45.4[d]	......	
Melville	80	23	50.0	5.11	
Minden	74	23	45.5	10.66	
Monroe	82	24	48.7	11.03	
New Iberia	76	28	54.0	3.00	
Opelousas	80	23	51.0	6.52	
Plain Dealing	75	18	46.5	10.47	
Port Eads	77	33	60.4	6.17	
Rayne	78	26	52.4	4.08	
Reserve	77	28	51.6	1.56	
Robeline	75	18	46.6	3.73	
Ruston	77	22	49.2	8.22	
St. Francisville	78	21	48.6	7.70	
Schriever	84[c]	24[e]	53.8[d]	3.72	
Southern University	......	......	......	2.85	
Sugar Experiment Station	78	29	55.0	3.02	
Sugartown	77	26	51.7	3.28	
Summerport	......	......	......	1.96	
Venice	79	29	54.6	13.75	
Maine.					
Bar Harbor	48	— 8	18.2	3.63	16.5
Chesuncook	......	......	......	0.59	16.0
Cornish	36	—10	15.4	1.66	8.2
Danforth	......	......	......	1.51	15.0
Fairfield	34	—19	11.8	1.44	16.0
***Maine*—Cont'd.**	°	°	°	*Ins.*	*Ins.*
Farmington	35	—23	12.2	1.76	18.5
Ft. Fairfield	35	—34	5.4	1.31	13.0
Gardiner	35	—21	14.6	2.28	14.8
Houlton	39	—20	9.1	1.44	14.0
Lewiston	37	—14	15.3	1.93	13.5
Madison	36	—22	10.8	1.55	12.8
Mayfield	33	—10	12.1	1.47	17.0
Millinocket	31	—22	9.0	1.89	16.4
North Bridgton	34	—13	16.0	1.67	11.2
Oquossoc	34	—25	8.0	1.99	21.0
Orono	39	—27	11.8	2.00	19.2
Patten	33	—20	7.4	1.50	15.0
Rumford Falls	33	—11	14.0	1.51	12.4
South Lagrange	32	—28	9.7	1.75	14.9
The Forks	......	......	......	1.58	17.8
Vanburen	31	—25	4.9	1.43	17.0
Vanceboro	42	—19	10.6	0.95	13.3
Winslow	30	—19	11.0	1.65	15.0
Maryland.					
Annapolis	58	10	30.0	3.50	......
Bachmans Valley	48	— 7	24.2	2.66	16.0
Boettcherville	63	— 6	31.0	1.63	8.5
Cambridge	60	12	32.4	4.29	21.5
Cheltenham	64	6	30.6	4.09	12.0
Chestertown	60	7	28.6	3.58	13.5
Chewsville	57	— 9	26.8	1.69	16.3
Clearspring	59	3	28.6	3.02	30.2
Coleman	60	9	30.0	3.34	15.0
Colora	......	......	......	2.41	18.5
Cumberland	......	......	......	1.97	6.0
Darlington	56[d]	— 1[c]	26.6[d]	......	10.0
Deerpark	59	—10	27.7	......	......
Denton	62	4	28.8	4.93	16.5
Easton	61	0	30.6	3.51	7.0
Fallston	57	4	27.5	2.96	15.4
Frederick	59	— 6	28.6	2.92	15.5
Grantsville	60	— 5	26.7	2.73	14.5
Greatfalls	63	0	29.2	......	......
Greenspring Furnace	60	— 2	28.2	2.61	14.8
Hancock	59	— 5	28.4	2.15	13.0
Harney	......	......	......	2.40	13.5
Jewell	63	6	31.2	3.89	10.8
Johns Hopkins Hospital	58	12	32.0	3.84	20.0
Keedysville	60	— 8	28.4	2.80	14.8
Laurel	58	— 2	29.8	3.58	17.0
Mount St. Marys College	58	8	29.2	2.23	16.0
New Market	56	0	27.7	3.53	18.5
Oakland	61	—11	27.7	4.00	28.0
Pocomoke City	64	12	34.2	5.83	7.0
Princess Anne	64	5	31.6	5.22	13.5
Solomons	60	13	33.7	4.13	15.5
Sudlersville	60	0	30.0	4.16	11.5
Takoma Park	59	5	29.4	4.69	21.0
Van Bibber	50	6	28.4	3.29	......
Westernport	53	0	29.0	2.09	9.2
Woodstock	56	7	30.8	2.72	15.5
Massachusetts.					
Amherst	44	— 4	19.4	2.75	10.0
Bedford	44	— 1	22.7	2.49	10.0
Bluehill (summit)	46	2	22.4	3.21	20.3
Cambridge	47	2	23.6	4.35	......
Chestnuthill	47	2	23.6	2.81	13.5
Concord	46	— 5	20.6	2.13	6.7
East Templeton*[1]	44	— 3	20.0	2.10	10.5
Fall River	50	6	26.2	3.92	26.5
Fitchburg *a*	44	1	21.4	1.77	8.9
Fitchburg *b*	46	0	21.6	2.44	11.0
Framingham	48	— 7	22.8	2.96	10.8
Groton	43	— 9	20.0	1.90	16.5
Hyannis	......	......	......	4.33	25.0
Jefferson	......	......	......	2.98	12.0
Lawrence	46	— 4	20.7	1.97	7.5
Leominster	......	......	......	2.54	9.4
Lowell *a*	45	0	22.4	2.33	......
Lowell *b*	47	— 1	22.2	......	......
Ludlow Center	......	......	......	2.33	7.0
Middleboro	49	— 9	22.4	4.12	26.6
Monson	47	—12	21.0	2.70	16.2
New Bedford	50	4	24.8	5.27	34.6
Pittsfield	......	......	......	2.71	18.0
Plymouth*[1]	50	8	27.2	4.10	23.5
Princeton	......	......	......	2.50	8.7
Provincetown	61	14	31.4	2.94	12.0
Salem	......	......	......	2.55	13.7
Somerset*[1]	45	— 2	23.4	4.40	29.5
Sterling	......	......	......	2.87	12.7
Taunton	44	— 11	21.0	3.25	18.5
Webster	......	......	......	2.94	14.5
Westboro	46	— 7	22.8	3.05	11.5
Weston	46	— 1	21.8	2.31	9.4
Williamstown	47	— 4	19.2	1.39	10.0
Winchendon	......	......	......	2.40	11.0
Worcester	48	4	22.8	2.20	14.3
Michigan.					
Adrian	56	—13	25.0	1.46	......
Agricultural College	52	—18	21.7	1.42	9.7
Allegan	52[f]	— 8[e]	23.0[f]	......	......
Alma	52	—14	22.2	1.64	11.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ann Arbor	52	— 4	22.9	1.67	8.2
Arbela	48	— 7	23.0	2.26	9.5
Ball Mountain	52	5	23.6	0.70	5.3
Baraga	50	1	21.4	1.95	19.5
Battlecreek	51	—16	21.0	1.58	12.5
Bay City	51	— 3	23.3	1.18	5.5
Benzonia	42	6	22.8	3.10	20.7
Berlin	51	6	23.4	1.07	5.0
Big Rapids	48	—16	19.8	2.41	10.0
Birmingham	52	5	23.9	0.62	5.2
Bloomingdale	53	— 7	23.8	......	
Calumet	44	5	19.4	4.36	54.5
Cassopolis	52	— 5	22.8	1.21	5.1
Charlevoix	......	......	......	2.80	28.0
Charlotte	62	—20	23.0	......	......
Chatham	46	— 7	16.9	3.56	35.0
Cheyboygan	44	2	21.4	......	......
Clinton	52	—12	24.0	1.77	5.5
Coldwater	53	—16	23.8	1.87	11.0
Deer Park	38	— 7	17.0	3.15	24.5
Detour	41	—10	18.4	1.60	16.0
Dundee	60	— 8	24.7	2.58	9.5
Eagle Harbor	48	8	21.2	4.57	45.8
East Tawas	49	— 3	20.9	1.25	5.0
Eloise	52	— 6	23.6	1.88	6.3
Ewen	41	—15	14.6	1.20	12.0
Fitchburg	50	—20	20.0	2.21	11.5
Flint	54	—12	22.9	1.13	6.5
Gaylord	......	......	......	1.20	7.0
Gladwin	46	—14	20.6	1.70	12.0
Grand Haven	43	— 1	24.6	......	......
Grand Marais	37[e]	— 3[d]	17.0[d]	3.51	32.0
Grape	59	— 5	24.5	1.90	7.4
Grayling	44	—14	18.8	2.40	12.0
Hagar	53	—14	23.5	1.84	12.8
Harbor Beach	48	5	23.9	1.27	8.2
Harrison	43[e]	......	......	1.30	13.0
Harrisville	46	2	21.2	2.38	17.2
Hastings	52	—15	21.0	1.55	10.5
Hayes	48	— 5	22.4	3.18	12.0
Highland	......	......	......	1.54	4.5
Hillsdale	53	—16	22.2	1.75	......
Howell	53	—14	20.7	1.11	4.0
Humboldt	42	—26	14.2	......	......
Iron Mountain	49	—11	17.2	1.98	19.0
Iron River [f]	50	—17	13.6	......	......
Ironwood	47	— 4	15.4	2.31	23.1
Ishpeming	37	— 6	14.6	3.22	32.2
Ivan	47	— 7	18.4	1.23	16.0
Jackson	53	—12	23.4	1.58	10.7
Jeddo	51	2	23.8	1.89	12.0
Lake City	......	......	......	1.20	7.0
Lansing	52	—13	22.5	1.27	8.1
Mackinac Island	35	— 5	19.4	1.97	13.7
Mackinaw City	42[e]	— 1[e]	20.5[d]	2.80	28.0
Mancelona	43	......	......	1.14	11.0
Marine City	......	......	......	1.48	5.0
Menominee	47	— 2	20.8	0.75	7.5
Midland	51	......	......	0.96	8.1
Montague	47	— 4	24.2	1.25	8.0
Muskegon	48	4	25.7	1.38	8.5
Newberry	40	3	19.7	0.70	7.0
Old Mission	46	5	22.6	1.55	10.9
Olivet	51	— 9	21.9	1.72	10.4
Omer	......	......	......	2.15	11.5
Onaway	43	— 2	19.8	......	......
Ovid	51	—17	21.4	1.25	5.5
Petoskey	40	3	21.2	3.20	31.0
Powers	44	— 9	16.7	1.95	19.5
Reed City	47	—15	21.2	1.52	9.0
Roscommon	45[d]	—18[d]	18.6[d]	1.05	5.5
Saginaw (W. S.)	52	—10	23.0	1.13	10.9
St. Ignace	38	—10	18.6	1.58	12.5
St. Johns	56	—14	24.2	2.20	12.3
Slocum	47	—10	23.2	1.05	6.0
South Haven	49	0	23.3	1.99	10.0
Stanton	50	—10	20.6	0.72	6.0
Thomaston	45	—16	14.4	2.00	20.0
Thornville	51	11	25.5	1.52	9.0
Traverse City	46[e]	5[e]	23.3[e]	1.63	11.3
Vassar	50	—13	23.0	0.75	4.1
Wasepi	52	—16	21.8	2.22	7.5
Webberville	52	—20	21.5	1.90	8.0
West Branch	......	......	......	0.92	9.0
Wetmore	41	0	17.9	2.80	28.0
Whitefish Point	41	— 4	19.0	3.18	34.6
Ypsilanti	52	— 6	23.0	1.96	7.1
Minnesota.					
Albert Lea	47	—11	18.7	1.80	18.0
Alexandria	50	—18	14.6	0.49	4.8
Angus	40	—23	11.3	......	......
Ashby	42	—18	16.7	0.65	7.0
Bemidji	46	—19	14.9	1.78	17.8
Bird Island	46	—12	18.8	0.66	5.1
Caledonia	44	—10	18.7	1.17	14.1
Collegeville	51	—13	19.0	0.60	8.5
Crookston	38	—23	11.0	0.60	6.0
Detroit	44	—23	12.1	0.83	8.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Faribault	50	—15	18.0	0.63	9.0
Farmington	49	—12	18.4	0.50	5.0
Fergus Falls	43	—18	16.4	0.82	8.0
Floodwood	49	—25	13.0	1.23	12.0
Glencoe	52	—11	17.0	0.30	3.0
Grand Meadow	44	—10	17.8	1.76	18.5
Hallock	38	—31	7.8	0.25	2.5
Lake Winnibigoshish	43	—19	11.4	0.81	11.6
Leech	48	—22	11.2	0.96	11.8
Long Prairie	53	—16	16.8	0.47	4.8
Luverne	52	—13	18.6	0.65	6.5
Lynd	54	—11	19.3	0.47	6.0
Mankato	......	......	......	0.37	7.2
Mapleplain	48	—12	19.0	0.58	5.8
Milaca	55	—14	17.2	0.14	3.0
Milan	52	—14	18.0	0.21	12.1
Minneapolis [1]	46[a]	—11	19.2	0.47	4.9
Montevideo	50	—14	18.4	0.77	8.0
Mora	57	—11	17.0	0.13	1.2
Morris	46	—16	16.8	0.73	7.3
Mount Iron	44	—21	10.0	2.61	26.1
New London	48	—18	15.7	0.80	5.5
New Richland	47	—12	18.6	1.05	10.5
New Ulm	54	—10	17.7	0.77	7.7
Park Rapids	43	—19	12.4	0.64	6.4
Pine River	47	—20	13.1	0.30	7.5
Pleasant Mounds	50	—11	19.5	0.83	10.0
Pokegama Falls	44	—37	5.2	1.01	13.8
Reeds	......	......	......	0.71	17.7
Rolling Green	40	—10	20.1	0.90	9.1
St. Charles	43	— 9	20.1	1.32	14.5
St. Cloud	54	—13	18.2	0.39	6.5
St. Peter	55	—22	19.8	0.65	6.5
Sandy Lake Dam	49	—22	13.2	0.76	9.2
Shakopee	37	—10	17.8	0.32	3.2
Two Harbors	48	—10	16.0	0.71	17.3
Wabasha	52	— 9	20.8	1.38	16.5
Wadena	46	—21	14.2	0.34	7.1
Willow River	53	—25	14.4	1.32	12.1
Winnebago	52	— 9	19.3	1.05	9.9
Winona	46	— 8	20.6	1.05	13.2
Worthington	57	—10	25.2	0.32	3.2
Zumbrota	45	—12	19.7	1.68	16.8
Mississippi.					
Aberdeen	70	18	43.2	4.52	
Austin	75[f]	16[f]	43.2[f]	9.81	0.5
Batesville	73	19	42.2	8.80	
Bay St. Louis	75	27	52.5	2.38	
Biloxi	70[e]	29[e]	51.7[e]	2.98	
Booneville	70	19	43.4	8.75	
Canton	78	21	47.8	2.57	
Columbus	74	20	43.7	5.06	T.
Corinth	68	19	41.9	9.67	0.5
Crystal Springs	85	24	50.2	5.40	
Duck Hill	76	20	47.2	3.57	T.
Edwards	74	22	47.0	4.16	
Enterprise	......	......	......	3.30	
Fayette	79	23	48.4	2.22	
Fayette (near)	......	......	......	1.91	
Greenville *a*	76	23	46.6	8.87	T.
Greenville *b*	75	25	46.6	9.26	
Greenwood	76	21	45.4	6.51	
Hattiesburg	......	......	......	3.72	
Hazlehurst	81	23	48.3	4.10	
Hernando	71	17	43.0	7.05	T.
Holly Springs	70	19	41.6	9.20	T.
Jackson	76	21	47.4	3.08	
Kosciusko	76	21	46.5	4.58	
Lake	81	19	45.3	4.10	
Lake Como	80	24	49.0	4.45	
Laurel	80	22	48.6	4.73	
Leakesville	80	21	50.5	3.76	
Louisville	75	20	46.6	4.60	T.
Macon	75	20	47.2	......	
Magnolia	84	22	53.4	5.83	
Natchez	76	29	52.2	3.98	
Nitta Yuma	73	25	44.4	2.74	
Okolona	73	20	43.9	......	
Patmos	......	......	......	7.28	
Pearlington	76	24	51.8	2.65	
Pecan	79	23	53.2	2.94	
Pittsboro	73	18	45.1	7.13	
Pontotoc	71	20	44.3	5.76	T.
Poplarville	78	24	52.4	4.06	
Port Gibson	80	22	48.2	4.15	
Ripley	74	14	40.8	13.70	T.
Shelby	76	17	46.0	5.65	
Shoccoe	78	19	48.2	2.21	
Shubuta	......	......	......	5.09	
Stonington	......	......	......	2.30	
Suffolk	80	23	49.9	2.65	
Tchula	77	20	48.4	4.17	
Tupelo	73	20	43.0	5.99	T.
University	72	17	45.3	9.22	T.
Utica	80	20	51.2	......	
Walnutgrove	79[e]	21[e]	48.4[e]	3.39	
Watervalley	74	19	45.7	10.95	T.
Waynesboro	80	20	50.4	6.65	

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Woodville	77	25	51.0	4.58	
Yazoo City	76	23	48.0	5.72	
Missouri.					
Appleton City	67	0	34.0	1.13	1.5
Arthur	71	2	36.2	1.29	3.0
Avalon	63	— 5	28.7	1.38	13.0
Bethany	59	— 6	26.8	1.20	12.0
Birchtree	64	6	36.8	1.81	2.3
Blue Springs	66	— 1	30.9	1.08	5.2
Boonville	......	......	......	1.90	2.0
Brunswick	62	— 3	29.2	2.33	8.7
Carrollton	68[d]	— 2[d]	30.0[d]	0.24	2.4
Caruthersville	66	13	40.7	4.52	T.
Conception	64	— 7	27.2	0.84	8.4
Darksville	60	— 3	30.8	3.02	15.2
Dean	67	5	38.5	0.90	1.0
Desoto	67	5	35.9	0.68	3.7
Doniphan	65	10	38.9	1.35	T.
Downing	......	......	......	2.70	8.5
Fairport	......	......	......	1.21	12.1
Fayette	60	— 3	29.0	1.22	5.5
Fulton	64	— 1	32.8	1.55	6.2
Gallatin *[1]	68	— 2	30.9	1.54	11.0
Gano	69	3	36.6	1.23	7.3
Glasgow	61	— 2	31.0	1.93	13.2
Gorin	......	......	......	2.47	5.6
Grant City	63	— 7	27.6	1.12	11.0
Harrisonville	66	1	31.0	1.53	8.3
Hazlehurst	......	......	......	1.08	9.8
Hermann	......	......	......	1.40	0.5
Houston	67	4	36.2	1.58	3.4
Ironton	66	6	35.1	1.46	3.5
Jackson	95	10	37.5	2.97	4.0
Jefferson City	68	0	32.5	1.18	4.4
Joplin	69	5[d]	39.5	1.15	5.0
Kidder	63	— 4	29.0	1.20	8.6
Koshkonong	67	6	38.4	1.85	1.5
Lamar	68	1	36.0	1.32	3.0
Lamonte	......	......	......	1.07	3.0
Lebanon	67	2	36.0	1.26	5.0
Lexington	64	0	32.8	1.53	6.0
Liberty	65	— 1	31.8	1.14	9.7
Lockwood	73	1	34.8	1.35	3.0
Louisiana	66	— 2	30.8	1.04	1.1
Macon	60	— 3	30.2	2.44	5.8
Marblehill	66	9	37.0	2.30	2.9
Marshall	65	0	31.4	1.82	5.4
Maryville	64	— 5	25.0	1.00	8.6
Mexico	63	— 1	31.6	1.26	8.1
Miami *[5]	61	— 1	30.7	1.87	10.4
Monroe	60	— 2	30.6	1.89	8.5
Montreal	69	0	35.8	1.51	6.5
Mountaingrove	63	2	35.5	1.81	2.9
Mount Vernon	65	3	36.2	1.28	4.0
Neosho	70	4	38.1	1.34	5.5
New Haven	68	4	35.0	1.55	8.0
New Madrid	......	......	......	3.53	......
New Palestine	73	2	34.1	1.15	3.5
Oakfield	67	2	35.0	1.12	5.7
Olden	69	— 5	38.4	0.98	0.4
Oregon	66	— 5	27.8	0.46	4.6
Palmyra *[5]	62	2	31.1	1.26	8.0
Pine Hill	......	......	......	1.86	4.0
Princeton	60	— 5	29.5	1.87	18.0
Rockport	......	......	......	0.12	3.0
Rolla	......	......	......	0.89	5.5
St. Charles	64	2	33.5	1.19	7.0
St. Joseph	......	......	......	0.83	7.0
Sarcoxie	......	......	......	1.25	3.4
Sedalia	65	0	33.0	1.18	6.8
Seymour	65	0	35.2	1.16	2.3
Sikeston	68	13	38.8	2.43	2.0
Steffenville	60	— 1	30.4	1.35	5.0
Sublett	59	— 3	28.8	2.40	16.0
Trenton	60	— 4	29.1	1.20	11.5
Unionville	60	—10	26.1	1.66	11.0
Versailles	67	— 1	34.0	0.92	4.3
Vichy [d]	75	— 1	33.1	0.40	4.0
Warrensburg	68	— 5	34.4	0.89	6.3
Warrenton	66	1	30.7	1.52	8.0
Warsaw	69	— 5	33.6	1.26	2.6
Wheatland	......	......	......	1.36	7.5
Willowsprings	67	2	35.7	1.80	3.2
Windsor [b]	67	6	33.9	......	......
Zeitonia	65	8	36.6	2.31	1.5
Montana.					
Adel	55	—22	28.3	0.95	9.5
Alzada	......	......	......	1.58	14.8
Anaconda	51	2	27.8	0.80	8.0
Augusta	60	—26	29.7	0.40	4.0
Billings	64	—19	32.4	......	2.2
Boulder	49	—17	25.6	0.21	2.6
Bozeman	50	—10	25.7	2.03	20.3
Butte	51	— 3	28.2	1.35	13.5
Canyon Ferry	54	—11	27.4	0.54	3.7
Cascade	67	—24	33.3	0.54	8.0
Chester	......	......	......	0.85	8.5
Chinook	64	—34	20.4	0.77	......

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Columbia Falls	46	4	28.7	2.18	6.5
Crow Agency	61	−20	27.6	1.30	9.0
Culbertson	55	−41	14.8	0.39	.....
Dayton	48	7	28.8	1.33	3.4
Decker	77	−15	29.8	0.10	1.0
Deerlodge	49	−8	25.0	.....	.....
Dillon	52	−18	28.2	0.29	2.7
Fallon	59	−35	20.0	0.29	.....
Forsyth	58	−26	25.8	0.50	5.0
Fort Harrison	65	−15	27.6	.....	.....
Fort Logan	48	−23	26.0	0.30	3.0
Glasgow [g]	44	−37	16.0	1.44	.....
Glendive	50	−40	18.2	0.90	9.0
Grayling	40	−39	14.6	1.01	23.0
Greatfalls	54	−20	31.4	0.38	.....
Hamilton	54	−10	30.8	0.97	5.0
Lakeview	.....	.....	.....	0.50	5.0
Livingston	55	0	33.6	0.45	4.0
Lewistown	58	−22	28.7	1.00	10.0
Lodgegrass	60	−21	27.8	0.50	2.5
Marysville	52[c]	−12[c]	27.2[c]	1.35	12.0
Missoula	50	−1	30.3	0.95	1.5
Ovando	43	−13	24.8	1.46	11.5
Parrot	53	−14	30.6	0.18	1.8
Philipsburg	53	−5	30.3	0.18	1.8
Plains	48	6	29.8	0.20	2.0
Poplar	51	−37	18.2	1.00	10.0
Redlodge	57	−13	28.6	0.36	8.0
St. Pauls	50	−30	24.0	0.79	23.0
St. Peter	51	−13	30.5	0.87	8.5
Saltese	.....	.....	.....	3.70	38.0
Springbrook	57	−32	21.1	1.02	7.7
Toston	49	−17	24.2	0.60	.....
Troy	50[c]	6[c]	31.6[c]	2.86	12.5
Utica	.....	−20	.....	0.24	.....
Warrick	.....	.....	.....	0.62	6.2
Wolf Creek	55	−11	31.0	0.42	5.0
Yale	57	−20	28.8	0.70	7.0
Nebraska.					
Agate	60	−7	27.4	0.36	4.0
Agee *[1]	70	−8	23.1	0.49	4.8
Albion	72[c]	−10[c]	24.4[c]	0.30	3.0
Alliance	68	−6	33.2	T.	T.
Alma	70	−3	29.1	T.	T.
Ansley	72	−8	27.2	0.15	1.5
Arapaho	.....	.....	.....	0.20	3.0
Arcadia	.....	.....	.....	T.	T.
Ashland *a*	62	−4	27.7	0.30	7.0
Ashland *b*	.....	.....	.....	0.27	4.0
Ashton	.....	.....	.....	T.	T.
Auburn	67	−3	29.2	0.42	3.8
Aurora	70	−6	27.2	0.02	0.2
Bartley	62	−3	30.0	0.10	0.5
Beatrice	64	−2	29.5	0.39	1.6
Beaver	63	−4	31.3	0.19	2.0
Bellevue	.....	.....	.....	0.65	8.0
Benkleman	.....	.....	.....	0.01	0.1
Bethany	.....	.....	.....	0.56	5.6
Blair	58	−8	25.4	0.20	2.8
Bluehill	.....	.....	.....	0.10	1.0
Bradshaw	.....	.....	.....	0.04	0.5
Bridgeport	71	−4	31.4	0.20	2.0
Broken Bow	75	−10	29.2	T.	0.1
Burchard	.....	.....	.....	0.05	2.0
Burge	.....	.....	.....	0.36	2.3
Burwell	.....	.....	.....	T.	T.
Callaway	74	−6	30.2	T.	T.
Central City	.....	.....	.....	T.	T.
Chester	.....	.....	.....	0.20	2.0
Cody	.....	.....	.....	0.17	1.7
Columbus	70	−6	24.6	0.13	2.0
Crawford	.....	.....	.....	0.41	3.0
Crete	60	−4	27.8	0.21	4.0
Culbertson	68	0	33.8	0.27	.....
Curtis	65	−2	28.8	0.28	1.0
David City	59	−6	26.3	0.18	3.0
Dawson	67	−1	29.6	0.19	1.9
Duff	.....	.....	.....	0.02	0.2
Dunning	.....	.....	.....	0.07	0.7
Edgar	.....	.....	.....	0.20	2.0
Ericson	.....	.....	.....	0.60	6.0
Ewing	.....	.....	.....	0.25	2.5
Fairbury	64	−5	27.4	0.22	1.5
Fairmont	60	−5	25.4	0.20	1.5
Fort Robinson	63	−4	30.1	0.32	3.2
Franklin	68	−3	29.5	0.25	0.2
Fremont	61	−10	26.0	0.25	2.5
Fullerton	.....	.....	.....	0.12	1.2
Geneva	61	−4	28.3	0.15	1.5
Genoa (near)	68	−10	27.2	0.25	3.7
Gering	69	−2	31.6	0.11	2.0
Gordon	.....	.....	.....	0.50	5.0
Gothenburg	75	−4	29.8	T.	T.
Grand Island *a*	70	−8	29.3	0.20	1.5
Grant	72	−2	31.5	0.20	2.5
Greeley	.....	.....	.....	0.10	1.0
Guide Rock	.....	.....	.....	0.30	3.0
Haigler	.....	.....	.....	0.03	.....

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Halsey	72	−10	29.2	0.05	T.
Hartington	62	−8	22.6	0.10	1.0
Harvard	60	−7	25.6	0.15	1.5
Hastings *[1]	66	−7	27.3	0.18	2.0
Hayes Center	.....	.....	.....	0.15	2.0
Hebron	61	−3	27.8	0.18	1.5
Hendley	.....	.....	.....	0.27	2.0
Hickman	.....	.....	.....	0.17	1.8
Holbrook	.....	.....	.....	0.40	3.0
Holdrege	65	−4	29.4	0.20	2.0
Holly	.....	.....	.....	0.42	4.2
Hooper *[1]	60	−6	25.2	0.12	2.3
Imperial	75	0	30.8	0.36	1.5
Johnstown	.....	.....	.....	0.05	0.6
Kearney	73	3	29.5	0.11	.....
Kennedy	72	−11	28.8	0.25	2.5
Kimball	67	−2	32.0	0.15	1.5
Kirkwood	73	−12	28.6	0.15	1.5
Leavitt	64	−16	24.1	0.20	2.0
Lexington	72	−4	28.2	0.40	2.0
Lockridge	63	−5	26.8	0.30	3.5
Loup	71	−8	27.2	0.20	4.0
McCook	.....	.....	.....	0.10	1.0
McCool	.....	.....	.....	0.07	.....
Madison	66	−8	24.9	0.35	3.5
Marquette	.....	.....	.....	0.30	3.0
Mason	.....	.....	.....	0.25	2.5
Merriman	.....	.....	.....	0.20	2.0
Minden	71	−6	27.8	0.20	1.0
Monroe	.....	.....	.....	0.30	3.0
Nebraska City	64	−4	29.0	0.50	4.0
Nemaha	.....	.....	.....	0.20	2.0
Norfolk	72	−9	24.8	0.23	3.5
North Loup	76	−8	27.2	0.05	0.5
Oakdale	68	−9	23.5	0.33	3.1
Odell	.....	.....	.....	T.	T.
O'Neill	72	−12	26.7	0.36	2.5
Ord	.....	.....	.....	0.05	.....
Palmer	.....	.....	.....	0.04	1.0
Palmyra *[1]	64	−4	27.6	0.15	1.5
Pawnee City	66	−2	29.5	0.70	6.0
Plymouth	.....	.....	.....	0.18	1.8
Plattsmouth *b*	.....	.....	.....	0.25	2.5
Purdum	74	−11	28.0	T.	T.
Ravenna *a*	76	−8	28.0	0.14	1.1
Redcloud	63	−4	26.4	0.15	1.5
Republican	.....	.....	.....	0.00	
Rulo	.....	.....	.....	0.49	4.0
St. Libory	.....	.....	.....	0.10	1.0
St. Paul	75	−7	28.2	0.09	1.0
Santee	67	−10	25.8	0.65	6.5
Schuyler	.....	.....	.....	0.25	2.5
Seneca	.....	.....	.....	T.	T.
Seward	60	−12	25.1	0.12	1.2
Smithfield	.....	.....	.....	0.20	2.0
Springview	71	−14	28.0	0.15	1.5
Stanton	66	−9	24.7	0.30	5.0
Strang	.....	.....	.....	0.05	0.5
Stratton	.....	.....	.....	0.21	.....
Stromsburg	.....	.....	.....	0.00	
Superior	57	−5	25.8	0.20	2.0
Syracuse	.....	.....	.....	0.40	4.0
Tablerock	.....	.....	.....	0.13	2.5
Tecumseh *b*	67	−3	27.4	0.21	3.0
Tecumseh *c*	.....	.....	.....	0.30	3.0
Tekamah	62	−7	25.2	0.25	2.5
Turlington	63	−4	27.9	0.58	6.0
University Farm	61	−4	28.0	0.22	2.7
Wahoo	.....	.....	.....	0.30	3.0
Wakefield	66	−9	23.8	0.21	2.1
Wauneta	.....	.....	.....	0.22	.....
Weeping Water	.....	.....	.....	0.50	5.5
Westpoint	65	−9	25.8	0.25	2.5
Whitman	.....	.....	.....	0.25	.....
Wilber	.....	.....	.....	0.45	4.5
Wilsonville	.....	.....	.....	0.40	4.0
Winnebago	64	−10	23.1	0.17	2.0
Wisner	.....	.....	.....	0.06	2.0
Wymore	.....	.....	.....	0.10	1.0
York	61	−5	28.4	T.	T.
Nevada.					
Amos	52	0	30.2	0.28	
Austin	52	2	38.6	0.88	
Battle Mountain	72	3	34.6	T.	T.
Belmont	54	1	30.1	0.50	5.0
Beowawe *[1]	52	4	30.4	0.10	1.0
Caliente	71	18	49.0	0.00	
Candelaria [k]	62	12	37.3	.....	.....
Carlin *[1]	46	−12	24.2	.....	.....
Carson City	60	4	33.8	0.85	1.5
Cranes Ranch	.....	.....	.....	0.64	
Dyer	58	−1	31.6	T.	
Elko *[1]	76	−20	29.6	1.60	16.0
Eureka	64	0	32.0	0.25	1.8
Geyser	.....	.....	.....	0.27	3.5
Golconda	.....	.....	.....	T.	T.
Halleck *[5]	60	−23	23.2	0.82	8.4
Hawthorne	58	12	35.2	0.20	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Humboldt	64	10	38.6	0.40	0.5
Lewers Ranch	65	8	36.5	3.63	11.0
Lovelocks	55	7	30.8	T.	T.
Martins	71	4	36.4	0.70	
Mill City *[1]	60	12	39.5	0.05	0.5
Palisade	58	−13	29.6	.....	
Pioche	56	−3	28.6	0.38	3.0
Potts	49	−19	23.8	0.37	3.5
Reno State University	58	11	34.0	0.63	.....
San Jacinto	56	−10	26.8	0.63	6.5
Sodaville	70	14	42.2	0.18	
Tecoma	.....	.....	.....	0.95	9.5
Wabuska	64	−4	34.0	0.10	1.0
Wadsworth	69	9	37.4	.....	.....
Wells *[1]	53	−23	26.0	1.30	13.0
Wood	49	−11	27.9	0.81	11.0
New Hampshire.					
Alstead	44	−5	16.4	1.76	8.2
Bartlett	.....	.....	.....	1.28	12.8
Berlin Mills	43	−26	10.6	1.33	13.0
Bethlehem	41	−12	11.6	1.41	11.0
Brookline *[1]	44	−11	20.7	2.25	8.0
Chatham	35	−15	13.0	1.10	7.0
Durham	43	−8	18.0	2.22	10.0
Franklin Falls	47	−7	17.4	1.80	8.2
Grafton	42	−12	13.4	1.26	6.0
Hanover	48	−12	13.3	1.57	10.2
Keene	47	−10	17.6	1.66	8.2
Nashua	44	−3	19.8	2.31	6.2
Newton	40	−6	19.8	1.95	6.0
North Woodstock	.....	.....	.....	1.77	.....
Plymouth	44	−9	15.0	1.36	13.0
Stratford	39	−23	10.2	1.31	12.0
New Jersey.					
Asbury Park	57	5	30.0	4.40	30.8
Bayonne	49	5	26.6	2.78	20.5
Belvidere	47	−2	23.6	2.77	19.5
Bergen Point	47	6	26.1	3.29	31.8
Beverly	52	3	27.6	3.11	23.7
Blairstown	44	−3	23.7	2.15	21.5
Bridgeton	59	0	29.2	4.09	24.5
Canton	.....	.....	.....	1.95	9.6
Cape May C. H.	60	7	31.4	5.02	19.0
Charlotteburg	51	−4	23.9	2.25	14.0
Chester	49	2	24.4	2.65	15.0
Clayton	58	−3	27.0	2.35	27.2
College Farm	49	1	25.8	2.07	.....
Dover	47	0	22.8	3.10	18.5
Englewood	49	6	25.6	4.19	21.5
Flemington	50	−10	25.0	2.09	21.5
Friesburg	60	0	28.4	2.99	18.5
Hightstown	49	0	26.8	3.21	23.5
Imlaystown	56	3	28.2	3.12	15.2
Indian Mills	58	0	28.6	3.77	23.6
Lakewood	58	3	28.9	3.77	22.9
Lambertville	50	−1	26.4	2.33	21.1
Layton	50	−15	21.0	2.26	22.6
Moorestown	53	1	27.0	2.93	18.0
Newark	48	5	26.2	2.87	24.8
New Brunswick	48	4	26.4	2.93	19.9
Newton	50	−4	24.4	3.10	21.5
Oceanic	56	4	28.8	3.52	21.6
Paterson	49	8	27.9	2.59	20.1
Phillipsburg	49	2	24.0	2.40	18.9
Plainfield	48	1	25.1	3.22	24.5
Pleasantville	.....	.....	.....	4.15	.....
Rancocas	.....	.....	.....	3.54	21.9
Rivervale	47	−14	22.2	2.98	26.0
Somerville	48	−1	24.8	2.06	16.0
South Orange	48	6	25.4	2.55	21.0
Sussex	45	−3	23.2	2.35	19.0
Trenton	55	10	31.2	2.30	12.0
Tuckerton	59	−1	29.6	4.77	16.5
Vineland	59	−3	27.8	4.08	20.5
Woodstown	.....	.....	.....	3.00	21.0
New Mexico.					
Alamagordo	55	17	41.6	0.75	3.0
Albert	76	13	39.5	0.71	7.0
Albuquerque	61	12	34.2	0.60	T.
Alma	70	11	40.0	1.50	
Arbela	71	1	40.7	0.25	2.0
Bellranch	72	10	40.6	0.61	4.0
Bloomfield	58	6	31.0	1.03	3.5
Brice	78	23	47.0	0.47	T.
Cambray	71	.....	.....	1.78	
Carlsbad	72[n]	14[j]	44.4[j]	0.28	3.0
Cimarron	70	0	33.7	0.29	3.5
Cloudcroft	48	−1	28.5	1.36	17.5
Deming	70	14	41.0	1.18	
Dorsey	70	0	34.2	0.23	3.0
Eagle Rock Ranch	61	−5	30.4	0.78	10.4
Elk	69	9	41.0	0.15	2.0
Engle	64	11	37.4	1.13	1.5
Estancia	62	−9	29.5	0.75	9.0
Fairview	73	11	41.1	1.15	.....
Fort Bayard	63	12	38.0	2.13	1.5
Fort Stanton	62	8	35.8	0.35	4.0
Fort Union	78	−4	34.4	0.70	9.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
New Mexico—Cont'd.					
Fort Wingate	60	− 4	30.2	2.26	23.3
Fruitland	62	5	29.4	0.26	1.5
Hillsboro	65	14	40.2	1.31	
Las Vegas	65	− 7	29.9	1.10	13.0
Lordsburg	78	17	43.2	1.21	1.3
Los Lunas	60	14	35.3	2.00	
Luna	59	4	31.5	1.30	8.2
Mesilla Park	73	16	42.0	0.63	
Mineral Hill	......	......	......	1.20	13.0
Mountainair	58	0	30.6	0.34	11.0
Raton	64	− 3	32.8	0.20	2.2
Rociada	65	− 7	34.0	0.54	10.0
San Marcial	66	11	39.1	0.20	T.
San Rafael	61	8	32.1	0.47	3.0
Socorro	60	15	36.5	1.12	T.
Springer	66	0	28.6	0.34	4.2
Strauss	72	26	......	0.40	0.8
Taos	56	− 3	27.0	0.30	4.0
Vermejo	70	− 8	32.2	0.08	1.0
New York.					
Adams	......	......	......	1.85	15.5
Addison	56	− 9	23.0	1.13	5.5
Akron	......	......	......	2.17	......
Alden	50	− 2	22.1	2.92	21.1
Ames	48	−15	19.4	2.53	15.5
Amsterdam	46	− 7	18.0	......	......
Appleton	50	5	25.3	1.51	......
Arcade	48	−20	17.4	3.89	29.4
Athens	50	− 5	22.2	1.70	15.0
Atlanta	52	− 9	20.8	2.05	10.5
Atwater	......	......	......	2.47	11.6
Auburn	50	0	22.6	2.77	14.0
Avon	51	− 4	22.2	1.89	16.0
Baldwinsville	48	− 4	20.6	3.09	20.0
Ballston Lake	46	−11	17.7	2.01	14.6
Bedford	57	1	24.9	3.75	15.3
Berlin	49	−10	18.6	2.86	15.1
Blue Mountain Lake	......	......	......	3.30	18.0
Bolivar	54	−16	21.1	2.41	12.1
Bouckville	48	− 8	18.2	3.88	23.0
Boyds Corners	......	......	......	3.48	......
Brockport	50	3	23.8	2.32	19.2
Caldwell	43	− 5	17.9	2.05	10.6
Cape Vincent	42	− 6	16.7	1.85	18.5
Carmel	44	− 3	20.8	3.26	26.3
Carvers Falls	44	−12	15.0	1.20	4.0
Chatham	47	− 2	20.5	1.46	14.5
Chazy	38	−28	10.4	1.00	8.0
Coeymans	......	......	......	2.23	12.3
Cold Spring Harbor	......	......	......	3.88	33.2
Cooperstown	43	− 5	18.4	2.49	11.0
Cortland	47	2	20.4	2.68	8.4
Cutchogue	48	9	27.2	6.17	49.0
Deansboro	......	......	......	2.50	10.0
Dekalb Junction	43	−16	11.4	1.45	8.8
De Ruyter	43	−6	19.4	2.73	11.3
Easton	......	......	......	1.62	10.0
Elba	48	− 5	22.4	3.54	18.0
Elmira	58	0	24.6	1.15	......
Faust	46	−21	10.4	5.00	......
Fayetteville	50	−10	20.8	2.61	10.7
Fort Plain	47	− 4	21.3	2.11	......
Franklinville	53	−22	20.0	3.52	25.5
Gabriels	42	−23	9.6	2.30	20.5
Gansevoort	......	......	......	2.86	17.0
Glens Falls	43	−12	16.2	2.03	12.4
Gloversville	44	−12	16.8	3.80	24.0
Greenfield	48	−10	17.3	3.05	13.5
Greenwich	49	−12	16.6	2.81	11.0
Griffin Corners	56	−17	18.6	1.93	14.1
Harkness	44	−19	12.2	1.15	4.5
Haskinville	......	......	......	2.00	9.6
Hemlock	50	− 4	22.4	1.96	12.0
Hunt	53	− 9	20.8	3.21	17.0
Indian Lake	52	−24	14.2	1.78	27.8
Ithaca	54	5	23.6	2.08	12.0
Jamestown	52	−12	22.8	2.42	14.6
Jeffersonville	47	−19	20.8	2.74	16.0
Keene Valley	49	−18	13.3	0.97	5.5
Lake George	43	− 8	17.4	2.96	14.4
Le Roy	50	− 3	22.3	2.81	21.3
Liberty	42	− 5	18.2	2.99	15.4
Littlefalls, City Res.	44	− 8	17.5	3.01	17.5
Lockport	50	1	23.6	1.32	......
Lowville	45	−19	13.3	2.74	25.8
Lyndonville	......	......	......	1.39	5.3
Lyons	50	− 8	23.5	2.84	24.0
Middletown	46	− 3	22.4	2.86	21.1
Mohonk Lake	49	− 1	20.4	2.27	20.5
Moira	41	−20	10.0	1.76	10.5
Newark Valley	......	......	......	2.29	14.0
New Lisbon	52	− 8	18.6	2.08	10.5
North Hammond	58	−14	13.8	0.64	6.5
Ogdensburg	44	−12	13.8	0.87	6.9
Old Chatham	......	......	......	3.16	19.5
Oneonta	53	− 1	21.8	2.64	14.5
Oswegatchie	......	......	......	2.11	......
Otto	55	1	21.0	1.46	......

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
New York—Cont'd.					
Oxford	49	− 1	20.9	3.75	23.9
Oyster Bay	54	9	28.4	4.95	25.2
Palermo	......	......	......	6.54	52.1
Perry City	50	− 8	20.8	1.80	13.0
Plattsburg Barracks	45	−18	13.8	0.20	......
Port Jervis	52	−10	22.0	2.10	16.7
Potsdam	42	−18	11.6	1.46	14.0
Primrose	50	− 3	23.9	3.10	25.5
Redhook	......	......	......	2.51	13.8
Richland	44	−10	17.2	4.35	33.5
Richmondville	55	− 6	18.8	2.62	15.2
Ridgeway	48	3	24.2	2.05	11.9
Ripley	60	0	26.3	3.55	27.0
Rome	43	− 4	18.8	4.66	26.5
Romulus	53	3	23.9	1.83	11.7
Salisbury Mills	......	......	......	3.58	18.5
Saranac	42	−18	14.2	1.77	7.2
Scarsdale	46	2	24.0	4.08	33.0
Setauket	50	11	28.4	3.63	25.6
Shortsville	51	− 5	22.5	2.06	7.5
Skaneateles	......	......	......	2.52	......
Southampton	49	5	27.6	6.38	57.4
South Butler	......	......	......	3.55	24.0
South Canisteo	51	−12	21.0	2.10	11.5
Southeast Reservoir	......	......	......	3.37	......
South Kortright	54	− 9	19.4	1.87	10.8
South Schroon	45	−12	13.8	2.06	18.4
Spier Falls	46	−11	18.2	1.75	8.3
Ticonderoga	45	− 6	16.9	1.09	8.1
Volusia	55	1	22.8	2.42	23.0
Wappinger Falls	46	−21	18.8	3.66	25.5
Warwick	......	......	......	2.13	23.0
Watertown	50	−17	16.1	2.32	19.0
Waverly	58	− 8	23.0	1.81	9.1
Wedgwood	48	3	20.4	1.87	9.0
Wells	45	−24	17.0	2.70	18.0
West Berne	48	−10	18.5	2.16	14.0
Westfield	58	2	24.8	1.98	18.7
Windham	58	−20	20.5	2.20	17.3
Youngstown	......	......	......	1.65	7.0
North Carolina.					
Brevard	65	12	38.7	4.54	3.8
Brewers	66	13	37.1	3.26	8.0
Bryson City	......	......	......	4.26	1.5
Chapelhill	70	18	38.0	3.38	9.0
Currituck	......	......	......	4.81	1.0
Eagletown	62	20	38.1	5.00	5.2
Edenton	67	20	40.3	5.80	4.0
Fayetteville	75	22	42.6	2.88	0.8
Goldsboro	74	22	39.0	3.41	1.2
Graham	......	......	......	3.30	5.4
Greensboro	69	16	39.4	3.19	3.0
Henderson	65	18	37.2	4.53	.5
Hendersonville	64	14	39.1	3.13	3.8
Henrietta	66	17	40.6	3.51	5.0
Horse Cove	62	12	39.0	6.28	4.2
Hot Springs	70	18	42.6	......	......
Jefferson	60[f]	10[f]	33.4[f]	......	......
Kinston	69	20	40.8	2.82	T.
Lenoir	59[j]	14[a]	38.8[g]	4.20	14.5
Lexington	68	14	38.4	3.69	5.0
Lincolnton	65	19	38.8	1.55	3.5
Linville	59	9	33.6	3.46	7.0
Littleton	70	14	36.6	3.13	6.5
Louisburg	70	19	38.3	3.31	4.0
Lumberton	76	22	42.3	2.50	
Manteo	64	24	43.2	5.23	
Marion	66	16	40.4	2.94	3.0
Marshall	63[d]	14[d]	37.4[d]	1.41	1.5
Moncure	74	13	39.5	3.13	6.8
Monroe	75	18	40.6	3.78	2.0
Morganton	64	14	39.6	2.85	5.6
Mount Holly	......	......	......	3.78	3.2
Murphy	......	......	......	4.60	1.1
Nashville	74[1]	18[1]	39.1[1]	......	7.8
Newbern	72	22	44.8	3.94	T.
Patterson[a b]	56	16	35.8	2.60	4.2
Pinehurst	75	22	42.0	2.70	......
Pittsboro	71	17	38.8	1.61	8.0
Reidsville	63	77	38.2	3.51	6.0
Rockingham	76	23	41.8	2.38	T.
Salem	63	17	37.2	3.73	3.0
Salisbury	70	16	37.4	3.53	6.0
Saxon	62	12	36.6	3.57	8.5
Scotland Neck	70	19	39.1	3.56	5.0
Selma	74	22	40.2	3.82	......
Settle	71[1]	20[1]	41.0[1]	3.10	7.7
Sloan	72	21	44.2	2.74	T.
Soapstone Mount	71	13[g]	38.4[d]	4.49	5.0
Southern Pines	80	21	42.6	3.80	......
Southport	67	24	47.8	2.35	
Statesville	67	14	38.4	3.64	3.2
Tarboro	75	20	40.0	4.48	2.8
Washington	69	20	42.4	3.12	T.
Waynesville	59	18	36.4	1.08	6.0
Weldon *a*	73	19	37.1	3.68	5.0
Weldon *b*	......	......	......	3.68	8.0
Whiteville	79	20	44.8	2.32	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
North Dakota.					
Amenia	45[f]	−20[f]	17.6[f]	0.06	6.0
Ashley	41	−23	12.7	0.50	5.0
Berlin	47	−25	13.4	0.72	7.2
Bottineau	40	−25	10.6	0.10	1.0
Cando	46	−26	12.4	0.29	2.9
Churchs Ferry	49	−24	11.8	0.30	3.0
Cooperstown	43	−27	12.8	0.17	1.7
Dickinson	52	−32	18.8	0.80	7.8
Donnybrook	45	−30	13.7	0.70	7.0
Dunseith	40	−28	10.0	0.40	4.0
Edgeley	46	−20	15.3	0.81	7.8
Ellendale	46	−17	17.8	0.35	3.5
Fargo	45	−21	12.3	1.37	13.7
Forman	48	−19	16.4	0.30	2.8
Fort Berthold	51	−35	17.6	0.30	3.0
Fort Yates	50	−26	19.6	0.64	9.5
Fullerton	45	−21	15.4	1.54	15.4
Glenullin	46	−28	18.0	0.94	8.4
Hamilton	42	−28	9.4	0.99	10.0
Jamestown	50	−30	16.0	1.35	13.5
Kulm	47	−22	15.5	0.69	8.3
Larimore	45	−20	12.6	0.10	1.0
Lisbon	46	−18	15.8	0.60	6.0
McKinney	47	−36	9.7	0.90	9.0
Manfred	42	−27	13.8	0.84	8.4
Mayville	42	−19	14.8	0.42	4.2
Medora	45	−43	17.8	0.84	8.4
Melville	47[e]	−22[e]	17.4[e]	0.10	1.0
Milton	40	−22	10.1	T.	T.
Minnewaukon	43	−26	14.2	0.00	
Minto	43	−23	8.9	0.31	3.1
Napoleon	45	−30	13.9	1.14	12.5
New England	55	− 3	19.3	0.90	9.0
Oakdale	55	−25	20.6	0.95	9.5
Park River	49	−24	12.4	0.23	3.3
Pembina	42	−30	7.1	0.50	5.9
Portal	40	−36	13.2	1.00	10.0
Power	45	−19	13.8	0.75	7.5
Rolla	41	−27	10.6	0.25	2.0
Rugby	40	−33	10.7	0.26	2.6
Sentinel Butte	54	−34	19.9	0.33	3.3
Steele	44[c]	−24[c]	14.8[c]	1.00	10.0
University	45	−16	14.8[c]	0.43	4.3
Wahpeton	47	−20	16.2	0.41	4.1
Walhalla	48	−32	11.6	0.20	2.0
Westhope	43	−32	11.2	0.21	2.1
Willow City	44[c]	−33[c]	8.6[c]	0.43	4.3
Wishek	42	−25	14.0	2.00	20.0
Ohio.					
Akron	61	4	26.0	2.62	12.5
Amesville	63	− 9	30.8	3.52	7.2
Atwater	......	......	......	1.85	6.0
Bangorville	60	5	27.0	3.98	7.6
Bellefontaine	59	− 2	25.8	3.67	4.0
Benton Ridge	62	− 4	27.5	2.70	6.0
Bowling Green	61	−10	24.6	2.16	5.6
Bucyrus	60	− 3	26.0	4.50	7.0
Cadiz	62	1	28.6	3.27	10.3
Cambridge	69	− 9	30.4	4.09	6.0
Camp Dennison	62	− 2	30.6	3.51	5.3
Canal Dover	61	− 6	27.4	2.82	4.5
Canton	61	2	27.2	2.23	7.6
Cardington	60	− 8	26.2	2.87	5.5
Chillicothe	63	− 4	29.4	3.59	9.8
Circleville	63	− 4	29.4	3.56	6.0
Clarington	67	− 2	32.2	2.78	12.2
Clarksville	61	− 2	30.4	3.58	6.1
Cleveland *a*	62	10	29.2	2.25	10.7
Cleveland *b*	62	10	26.6	2.94	12.0
Clifton	60[c]	− 6[c]	27.8[c]	3.22	7.0
Coalton	63	−11	31.1	3.80	12.3
Colebrook	59	− 1	24.8	2.35	7.0
Dayton *a*	......	......	......	3.68	7.0
Dayton *b*	62	− 4	29.3	4.16	6.8
Defiance	60	−10	25.2	2.44	6.1
Delaware	61	− 5	26.6	3.45	7.2
Demos	61	1	29.6	2.84	5.0
Findlay	62	0	26.0	2.40	2.0
Frankfort	60	− 8	30.4	2.97	6.0
Fremont	61	0	27.6	2.24	4.8
Garrettsville	62	− 6	26.2	2.27	8.6
Granville	61	− 5	28.2	4.62	8.0
Gratiot	60	− 7	28.4	4.74	8.6
Green	66	3	33.4	2.94	6.5
Greenfield	62	1	30.4	3.26	7.0
Greenhill	65	− 7	26.0	2.21	5.0
Greenville	63	− 5	26.8	3.93	6.0
Hedges	59	−11	25.6	2.30	3.0
Hillhouse	61	− 3	24.9	1.52	8.0
Hiram	61	5	25.6	1.96	10.3
Hudson	58	1	24.8	2.30	8.0
Ironton	66	2	34.6	2.99	5.5
Jacksonburg	62	4	29.5	4.22	5.0
Killbuck	60	0	26.4	3.59	6.5
Lancaster	62	− 5	29.4	3.54	7.0
Lima	54	− 1	27.3	3.25	5.0
McConnelsville	62	− 3	29.8	3.65	12.0
Manara	61	1	28.4	3.11	3.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Ohio—Cont'd.					
Mansfield	...	...	...	3.16	6.3
Marietta	62	0	31.6	2.82	8.3
Marion	61	−2	27.6	3.11	5.0
Medina	61	−10	26.2	2.61	11.4
Milfordton	61	−3	25.6	3.40	6.0
Milligan	62	−10	29.6	3.38	8.2
Millport	62	−8	26.4	1.86	7.0
Montpelier	54	−15	24.4	2.09	8.2
Napoleon	67	−8	27.4	1.93	3.0
Nellie	58	−3	28.0	2.42	6.5
New Alexandria	63	−6	27.9	4.00	...
New Berlin	60	0	26.6	2.15	5.5
New Bremen	60	−8	27.2	3.52	6.0
New Richmond	62	4	32.2	3.59	6.8
New Waterford	62	−5	26.2	3.21	12.0
North Lewisburg	59	−4	26.6	4.10	8.0
North Royalton	60	6	26.4	1.65	12.0
Norwalk	59	0	27.2	3.94	6.5
Oberlin	63	−3	27.5	2.75	7.8
Ohio State University	62	−2	28.2	2.97	5.7
Orangeville	61	−16	25.2	1.45	4.0
Ottawa	60	−7	25.6	2.65	2.7
Pataskala	62	−3	27.7	4.39	5.7
Philo	62	4	30.2	3.00	8.0
Plattsburg	60	4	27.8	4.97	9.0
Pomeroy	59	−1	32.1	3.31	12.0
Portsmouth *a*	...	...	...	3.84	13.0
Portsmouth *b*	64	−5	33.6	3.81	13.2
Pulse	60	−4	29.5	4.21	8.5
Rittman	60	−1	27.0	1.60	4.0
Rockyridge	62	−3	26.2	2.15	3.2
Shenandoah	64	−1	25.6	2.28	3.9
Sidney	60	−7	27.6	4.05	6.7
Somerset	60	−6	29.2	4.55	...
South Lorain	63	−5	27.6	2.31	7.7
Springfield	...	...	...	4.07	...
Thurman	64	−6	31.4	4.20	6.0
Tiffin	60	2	26.8	3.72	8.4
Upper Sandusky	61	−2	27.6	3.13	4.9
Urbana	60	−6	26.8	3.01	6.2
Vickery	61	−7	26.3	1.73	3.2
Warren	62	−3	26.6	2.56	12.8
Wauseon	59	−10	24.2	1.99	9.1
Waverly	63	−3	30.8	4.40	10.8
Waynesville	60	0	28.7	4.93	9.0
Wellington	62	0	27.9	2.56	7.0
Willoughby	...	...	...	1.92	6.0
Wilson	64	−9	31.5	4.04	11.0
Wooster	63	−1	28.0	2.68	5.5
Zanesville	...	...	...	3.78	6.3
Oklahoma.					
Alva	74	6	37.3	1.85	18.5
Arapaho	70	7	37.6	0.70	7.0
Beaver	70	2	33.4	0.70	7.0
Binger	74	9	38.5	0.40	4.0
Busch	67	12	35.0	...	...
Chandler	72	12	39.0	0.50	2.8
Cleo	75	3	38.5	0.95	9.5
Cloud Chief	76	5	39.6	1.20	12.0
Eldorado	76[g]	9[g]	41.1[g]	0.20	2.0
Enid	72	6	35.4	1.35	10.0
Erick	68	11	38.4	0.44	4.7
Fort Reno	72	2	37.9	1.55	15.5
Fort Sill	65	12	40.1	0.25	2.5
Frederick	71	12	43.2	...	...
Gage	69	2	34.5	0.87	8.8
Grand	...	...	...	1.10	11.0
Guthrie	69	10	37.8	0.72	6.0
Harrington	66	10	37.4	0.52	5.2
Hennessey	73	8	39.6	1.00	10.0
Hobart	73	10	39.3	0.30	3.0
Jefferson	68	5	34.2	0.65	6.5
Jenkins	68[e]	8[d]	34.2[e]	1.40	14.0
Kenton	70	2	35.7	0.75	7.5
Kingfisher	73	9	39.0	0.94	6.5
McComb	73	13	40.5	0.43	...
Mangum	75	15	40.4	0.75	7.5
Meeker	73	10	40.4	0.65	6.5
Newkirk	68	2	34.9	1.00	4.0
Norman	71	9	40.6	0.56	1.0
Okeene	78	11	37.0	0.72	7.2
Perry	71	6	37.4	0.97	6.5
Shawnee	74	12	41.6	0.44	...
Stillwater	70	10	36.6	0.86	5.3
Taloga	64	10	33.8	1.10	11.0
Temple	76	12	43.1	0.33	0.2
Waukomis	74	9	41.8	0.74	6.0
Weatherford	71	6	36.1	0.45	4.1
Whiteagle	71	5	35.9	1.29	12.0
Oregon.					
Albany	...	...	...	8.46	
Alpha	56	27	43.0	14.73	
Arlington	59	19	37.4	1.61	
Ashland	55	20	38.6	5.22	1.0
Astoria	57	35	44.6	15.02	
Aurora (near)	57	26	41.5	6.72	
Bay City	58	29	44.9	16.58	
Bend	55	0	32.8	1.86	11.0
Oregon—Cont'd.					
Beulah	47	4	26.9	1.01	10.0
Blackbutte	59	24	41.5	8.15	2.0
Blalock	59	21	39.4	1.26	T.
Bullrun	...	...	...	12.18	T.
Burns	50[c]	−6[c]	29.0[c]	2.84	13.5
Butter Creek	...	...	...	1.15	T.
Cascade Locks	57	30	40.0	14.46	
Coquille	...	...	...	7.86	
Corvallis	58	26	41.9	9.05	
Dayville	58	10	36.6	1.50	0.2
Doraville	51	27	39.8	7.86	2.5
Drain	61	29	43.6	10.06	
Ella	...	...	...	1.17	1.0
Eugene	58	27	41.9	7.98	
Fairview	62	30	46.6	14.95	T.
Falls City	54	24	40.0	16.47	
Forestgrove	55[c]	24[c]	41.2[c]	13.49	1.3
Gardiner	57	32	45.0	15.26	
Glendale	62	23	39.5	11.83	2.5
Glenora	58	24	40.7	25.06	4.0
Gold Beach	60	31	47.6	15.05	
Government Camp	54	12	32.1	12.07	43.0
Grants Pass	60	27	38.8	8.60	
Grass Valley	52	10	33.0	0.78	5.0
Heppner	60	18	36.9	1.72	
Hood River	59	28	38.9	6.06	1.5
Huntington	48	3	28.6	...	13.0
Jacksonville	51	23	37.8	7.99	
John Day	55	8	34.2	1.47	0.5
Joseph	56	3	27.7	2.44	20.2
Kerby	59	26	39.6	13.83	
Klamath Falls	63[d]	9[d]	32.7[d]	1.54	0.8
Lagrande	51	6	33.6	2.17	4.5
Lakeview	51	−1	29.4	3.27	17.8
Lonerock	59	8	34.9	1.12	1.5
McKenzie Bridge	56	18	37.2	13.90	
McMinnville	54	28	42.6	8.90	
Marshfield	61	29	46.0	14.14	
Meacham	...	...	...	3.25	19.0
Monroe	55	23	41.8	9.83	T.
Mount Angel	60	26	42.8	9.49	
Nehalem	...	...	...	18.34	
Newport	60	35	47.0	10.89	
Ontario	...	...	...	0.70	5.5
Pendleton	59	14	37.0	1.52	2.0
Pine	48	0	26.4	3.38	23.0
Prineville	55	8	34.0	0.94	
Riverside	55	0	28.0	1.15	3.0
Salem	56	28	42.8	6.65	
Sparta	48	5	31.0	3.75	37.0
Stafford	58	26	41.7	8.18	0.5
The Dalles	60	25	39.2	1.79	
Toledo	60	31	44.6	17.40	
Umatilla	58	20	37.8	0.80	
Vale	52	0	26.6	1.83	4.3
Wallowa	47	−1	29.3	2.17	13.5
Wamic	56	12	34.0	2.29	4.0
Warm Spring	57	12	36.0	1.21	1.5
Weston	58	5	33.4	2.37	6.5
Williams	63	18	40.2	7.71	T.
Pennsylvania.					
Aleppo	67	−10	29.8	2.91	10.0
Altoona	55	−7	25.0	1.98	...
Beaver Dam	...	...	...	3.01	...
Bellefonte	53	−8	25.0	1.52	13.0
Brookville	...	...	...	3.10	11.2
Browers	...	...	...	3.30	24.5
California	70	−2	31.6	2.09	8.4
Cassandra	56	−4	24.7	3.13	23.5
Centerhall	...	−7	...	1.32	9.2
Clarion	...	...	...	2.99	9.6
Claysville	64	−11	29.4	2.65	12.8
Clearfield	...	...	...	1.51	13.1
Coatsville	52	4	25.8	3.08	20.8
Confluence	...	...	...	3.24	...
Coudersport	50	−14	21.0	...	...
Davis Island Dam	...	...	...	2.61	...
Derry	69	−2	29.6	2.58	12.0
Doylestown	...	...	...	3.01	...
Dushore	51	−4	22.8	2.19	12.4
East Bloomsburg	...	...	...	1.77	14.2
East Mauch Chunk	57	2	24.6	2.51	15.0
Easton	47	2	24.6	2.79	19.5
Ellwood Junction	...	...	...	2.47	...
Emporium	53	−10	25.1	2.89	12.1
Ephrata	54	−2	25.4	2.61	22.0
Everett	52	−8	26.8	2.45	11.0
Forks of Neshaminy	...	...	...	2.35	...
Franklin	63	−10	26.1	2.11	11.0
Freeport	65	−9	29.2	3.01	8.4
Gettysburg	56	4	28.5	2.93	18.5
Girardville	...	...	...	3.28	26.2
Gordon	54	−6	24.0	2.40	24.0
Greensboro	...	...	...	2.46	7.0
Greenville	62	−7	25.6	2.16	14.8
Hamburg	49	5	27.3	3.32	21.0
Hanover	56	2	27.9	2.30	18.3
Herrs Island Dam	...	...	...	2.01	3.5
Pennsylvania—Cont'd.					
Huntingdon *a*	...	...	...	1.92	13.0
Huntingdon *b*	59	−9	25.6	1.78	11.6
Indiana	66	0	26.4	2.73	9.0
Irwin	69	−9	29.8	2.81	7.7
Johnstown	56	−4	28.6	3.01	13.9
Keating	...	...	...	2.11	6.3
Kennett Square	54	3	26.6	2.04	17.4
Lansdale	...	...	...	1.93	...
Lawrenceville	56[c]	−12[c]	20.6[c]	1.60	10.0
Lebanon	51	−3	25.4	2.71	18.4
Leroy	52	−4	21.6	1.65	10.5
Lewisburg	52	−9	24.5	1.79	15.6
Lockhaven *a*	53	−8	24.9	2.83	16.2
Lockhaven *b*	...	...	...	2.39	14.0
Lock No. 4	...	...	...	2.35	6.7
Lycippus	70	1	30.2	2.69	14.4
Marion	50	−4	26.3	2.90	24.0
Mifflin	...	...	...	2.15	18.0
Mifflintown	55	−8	24.8	1.63	14.8
Milford	54	−9	22.4	2.34	19.2
Montrose	49	2	20.0	1.75	14.0
New Germantown	56	−6	26.2	2.09	14.0
Oil City	...	...	...	2.80	12.1
Ottsville	...	...	...	2.47	...
Parker	...	...	...	3.12	9.4
Philadelphia	53	11	30.6	2.43	20.1
Pocono Lake	52	−10	19.7	2.39	13.0
Point Pleasant	...	...	...	2.47	...
Pottsville	...	...	...	2.49	...
Quakertown	50	−1	25.8	3.16	8.8
Reading	52	0	26.8	2.30	22.1
Saegerstown	61	−14	24.0	2.43	11.2
St. Marys	48	−3	21.6	1.77	10.5
Saltsburg	...	...	...	2.73	10.0
Seisholtzville	...	...	...	2.06	...
Selinsgrove	53	−6	25.7	2.45	17.5
Shawmont	...	...	...	1.88	...
Skidmore	61	−7	26.0	2.29	8.0
Smethport	50	−19	21.4	1.85	11.5
Smiths Corners	...	...	...	2.03	...
Somerset	59	−5	25.6	3.47	15.8
South Eaton	54	2	24.6	1.90	10.5
Springmount	...	...	...	2.10	...
State College	53	−5[c]	24.2	1.78	11.2
Swarthmore	55	5	27.6	2.30	17.0
Towanda	55	−1	23.0	1.59	9.1
Uniontown	71	−5	30.8	1.89	8.0
Warren	55	−8	23.6	2.20	12.2
Wellsboro	46	−5	22.9	...	8.5
Westchester	55	5	27.2	3.02	21.8
West Newton	...	...	...	3.32	11.0
Wilkesbarre	54	1	26.1	3.38	26.0
Williamsport	53	−3	24.4	2.63	12.8
Rhode Island.					
Bristol	44	8	26.3	3.82	24.0
Kingston	50	4	23.2	4.97	28.0
Pawtucket	48	0	24.1	4.20	20.4
Providence *a*	48	8	24.6	4.31	22.0
Providence *c*	48	5	24.2	3.29	18.1
South Carolina.					
Aiken	77	21	46.4	3.25	
Allendale	63	23	40.6	1.60	
Anderson	74	18	45.1	4.38	0.8
Batesburg	75	21	46.0	3.29	...
Beaufort	70	27	52.1	1.56	
Blackville	77	22	47.1	2.39	
Bowman	76	23	47.6	2.07	
Calhoun Falls	...	...	...	2.54	
Camden	...	...	...	2.57	
Cheraw *a*	78	22	42.0	2.60	...
Cheraw *b*	...	...	...	2.77	
Clarks Hill	75	22	45.9	3.97	
Clemson College	68	16	40.5	3.56	0.5
Conway	75	23	45.3	2.30	
Darlington	77	19	44.5	2.47	
Dillon	76[d]	21[d]	44.2[d]	1.52	
Duewest	68	23	45.4	3.88	T.
Effingham	...	...	...	2.50	
Florence	73	22	43.7	2.04	
Gaffney	68	20	41.2	3.71	7.0
Georgetown	75	28	48.0	...	...
Greenville	67	17	39.1	4.90	6.2
Greenwood	70	22	42.7	4.72	
Heath Springs	68	18	40.8	3.49	1.0
Kingstree *b*	...	...	...	1.70	
Liberty	66	17	42.5	3.77	2.5
Little Mountain	67	23	44.8	3.52	0.2
Lugoff	76	19	43.0	4.30	T.
Newberry	75	21	43.4	3.73	2.0
Pelzer	...	...	...	2.62	2.5
Pinopolis *[1]	72	26	47.2	1.59	
St. George	71	21	45.4	1.00	
St. Matthews	75	27	45.1	2.06	
St. Stephens	...	...	...	1.36	
Saluda	75	20	44.3	3.64	
Santuck	66[e]	18[e]	41.8[e]	3.96	2.5
Seivern	78	19	45.0	3.18	T.
Smiths Mills	...	...	...	2.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Society Hill	74	24	47.8	2.49	
Spartanburg	67	21	40.4	4.10	3.8
Statesburg	77	25	46.8	2.32	
Summerville	72	22	47.8	1.64	
Trenton	74	23	46.1	4.26	T.
Trial	72	18	46.0	1.58	
Walhalla	74	16	41.7	4.47	T.
Walterboro	77	21	51.5	1.44	
Winnsboro	75	22	42.8	3.70	T.
Winthrop College	72	20	42.0	3.23	1.0
Yemassee	73	21	48.0	1.28	
Yorkville	73	23	42.6	3.30	4.0
South Dakota.					
Aberdeen	49	−21	16.8	1.60	8.6
Academy	67	−15	25.0	0.35	3.5
Alexandria	60	−15	20.6	0.16	3.0
Armour	65	−12	25.6	0.14	1.2
Ashcroft	55	−33	22.4	1.10	11.0
Bowdle	49	−24	18.4	0.65	6.5
Brookings	58	−15	17.7	0.20	......
Canton	58	−16	22.2	0.09	1.5
Cavite	67	−17	23.2	0.25	.....
Centerville	......	......	......	0.75	7.8
Chamberlain	55	−14	21.8	0.59	6.0
Cheyenne	53	−23	20.4	T.	T.
Clark	52	−21	17.3	0.59	5.9
Clear Lake	48	−15	17.0	0.13	......
DeSmet	61	−17	21.0	0.65	6.5
Doland	47	−20	17.8	0.50	8.0
Elkpoint	65[d]	−11[d]	24.2[d]	0.66	6.0
Fairfax	70	−12	26.4	T.	T.
Farmingdale	......	......	......	0.89	3.0
Faulkton	51	−19	18.2	0.54	8.0
Flandreau	47	−15	17.9	0.53	3.4
Forestburg	52	−16	19.3	0.38	3.8
Fort Meade	69	−12	28.0	0.72	......
Gannvalley	50	......	......	0.35	3.0
Grand River School	56	−26	19.7	0.14	5.5
Greenwood	72	− 9	27.4	0.32	3.2
Herreid	47	−30	16.9	......	......
Highmore	54	−21	19.4	0.60	6.0
Hotch City	63	−17	21.0	0.37	6.5
Howard	55	−16	19.6	0.21	1.5
Howell	49	−19	17.0	0.46	4.4
Ipswich	51	−20	16.6	0.30	3.0
Kidder	53	−21	16.2	1.10	7.0
Kimball	60	......	......	0.18	1.0
Leola	50	−19	19.0	0.30	5.0
Leslie	60	−20	21.8	0.00	
Marion	56[e]	−15[e]	21.5[e]	0.59	4.0
Mellette	52	−20	18.6	0.20	2.0
Menno	60	−12	23.2	0.47	5.0
Millbank	58	−12	17.0	0.32	8.5
Mitchell	62	−12	25.4	0.50	5.0
On-the-Trees Camp	54	−23	21.2	0.70	7.8
Pine Ridge	67	−14	26.2	0.20	3.5
Ramsey	53	−18	17.4	0.30	3.0
Redfield	53	−20	16.6	0.35	3.2
Silver City	......	......	......	0.73	6.0
Sioux Falls	59	−15	20.5	0.41	4.0
Sisseton Agency	53	−21	18.1	0.64	6.4
Spearfish	63	− 7	30.0	0.66	7.0
Stephan	47	−20	18.4	0.60	7.0
Tyndall	59	−10	24.9	0.22	......
Vermillion	65	−10	25.0	0.50	4.3
Watertown	51	−17	16.6	0.34	6.3
Wentworth	55	−16	18.6	0.34	3.4
Wolsey	......	......	......	0.53	5.2
Tennessee.					
Andersonville	60	12	36.0	6.54	0.4
Ashwood	70	21	41.6	5.63	......
Benton	72	16	41.8	5.41	T.
Bluff City	......	......	......	3.52	1.4
Bolivar	69[e]	17[h]	40.8[e]	7.55	T.
Bristol	66	13	36.6	3.80	4.0
Byrdstown	67	12	39.2	4.92	1.3
Carthage	66[j]	21[j]	39.0[j]	5.13	0.2
Catlettsburg	......	......	......	4.31	
Cedar Hill	70	16	40.4	6.38	T.
Celina	......	......	......	5.21	
Charleston	......	......	......	4.49	2.0
Clarksville	67	15	40.6	6.51	0.5
Clinton	......	......	......	6.67	T.
Covington	65	17	40.7	8.00	T.
Decatur	68	14	41.0	5.40	T.
Dickson	71	11	39.8	7.60	T.
Dover	75	12	41.2	6.69	T.
Dyersburg	65	18	39.8	5.75	T.
Elizabethton	70	14	38.2	4.72	2.6
Erasmus	70	9	37.6	7.10	2.6
Florence	68	17	41.4	5.52	T.
Franklin	68	16	40.7	6.71	T.
Grace	......	......	......	5.50	
Greeneville	66	14	39.8	3.48	3.2
Halls Hill	......	......	......	5.24	
Harriman	66	17	39.8	6.72	T.
Hohenwald	70	10	39.4	7.80	0.7
Iron City	70	12	40.9	6.95	T.
Tennessee—Cont'd.					
Isabella	69	16	40.7	5.64	1.1
Jackson	70	19	42.8	6.40	......
Johnsonville	71	14	40.9	7.36	T.
Jonesboro	68	14	38.6	3.27	T.
Kenton	66	16	40.9	7.43	1.0
Kingston	......	......	......	5.90	1.4
Lafayette	70	11	39.0	5.00	......
Leadvale	......	......	......	3.00	T.
Lewisburg	70	18	42.3	5.47	0.1
Loudon	......	......	......	5.79	T.
Lynnville	69	17	40.2	4.07	0.5
McKenzie	67	15	41.5	......	
McMinnville	68	14	41.4	5.68	3.8
Maryville	70	15	41.4	4.96	T.
Monterey	62	19	40.2	......	......
Newport	70	17	40.0	3.81	T.
Nunnelly	72	17	41.1	6.09	T.
Palmetto	69	15	41.6	5.82	T.
Pope	70	12	41.4	7.90	T.
Rogersville	67	14	38.7	4.47	2.0
Rotherwood	......	......	......	4.18	0.1
Rugby	67	5	36.6	6.02	1.5
Savannah	71	12	43.1	6.28	T.
Sewanee	62	12	39.6	4.64	T.
Silver Lake	59	8	33.9	4.46	10.0
Springdale	69	14	38.3	5.83	1.0
Springville	71	14	41.0	7.19	0.1
Tazewell	......	......	......	5.78	1.6
Tellico Plains	70	17	43.2	4.56	1.0
Tracy City	64	12	38.8	5.93	T.
Trenton	67	17	41.9	7.57	T.
Tullahoma	67	15	40.6	5.88	T.
Walling	......	......	......	6.42	T.
Wildersville	68	21	41.9	8.60	0.2
Yukon	69	16	41.4	6.50	......
Texas.					
Albany	77	18	46.0	0.38	
Alvin	......	......	......	4.10	
Arthur	......	......	......	0.40	
Athens	80	18	47.6	1.25	
Austin	80	24	52.8	0.87	
Ballinger	74	17	45.2	0.54	0.5
Beaumont	82	26	55.2	2.47	
Beeville	85	28	56.4	3.41	
Bigspring	74	16	44.1	0.43	1.5
Blanco	74	19	46.2	1.23	
Boerne	83	21	49.3	1.67	
Bonham	72	18	47.2	0.51	
Booth	......	......	......	6.75	
Bowie	76	14	45.4	0.02	0.2
Brazoria	82	27	57.0	3.89	
Brenham	81	26	51.8	6.05	
Brighton	84	28	57.4	2.30	
Burnet	75	20	49.6	1.79	
Channing	76	9	37.8	0.60	6.0
Childress	76	17	41.0	0.35	2.5
Clarksville	75[d]	19[d]	44.5[d]	1.14	T.
Claytonville	74	17	45.6	0.63	2.5
Coleman	77	20	49.2	0.50	
College	82	19	51.6	3.95	
Colorado	74	15	45.3	0.59	2.0
Columbia	79	25	54.2	6.63	
Columbus	......	......	......	3.38	
Comanche	74[e]	11[e]	45.4[e]	0.20	
Corsicana	85	22	50.6	0.59	
Cotulla	79	28	53.2	0.60	
Crockett	82	22	53.2	8.11	
Cuero	82	29	55.6	6.66	
Dallas	76	20	46.6	0.74	
Danevang	83	24	55.5	2.50	
Decatur	73	18	47.2	0.00	
Dialville	75[e]	......	49.4[h]	5.37	
Duval	81	24	52.0	1.20	
Estelle	82	18	47.4	0.53	
Fort Brown	89	39	62.4	1.26	
Fort Clark	80	23	51.9	0.29	
Fort Davis	66	13	43.6	0.56	
Fort McIntosh	86	22	56.5	0.70	
Fort Ringgold	87	24	60.6	0.29	
Fort Stockton	76	16	45.8	0.18	
Fredericksburg	76[e]	21[e]	49.6[e]	1.66	
Gainesville	73	14	44.6	0.42	
Gatesville	74	19	50.2	1.00	
Georgetown	83	20	51.2	1.32	
Graham	77	13	46.6	0.17	0.5
Grapevine	74[g]	20[g]	48.0[g]	0.37	T.
Greenville	76	18	48.5	0.82	
Hale Center	75	16	41.3	0.05	0.5
Hallettsville	79	27	54.7	3.73	
Haskell	78	14	44.5	0.41	0.5
Hearne	83	21	50.0	2.58	
Hempstead	......	......	......	4.39	
Hewitt	......	......	......	0.49	
Hillsboro	73	19	48.3	0.77	
Hondo	82	28	54.4	1.25	
Houston	81	28	52.0	2.39	
Huntsville	76	24	51.5	6.45	
Ira	......	......	......	0.40	3.0
Texas—Cont'd.					
Jefferson	76	22	48.8	8.15	
Jewett	81	12	48.4	4.00	
Junction	......	......	......	0.48	
Kaufman	74	18	49.0	0.36	
Kerrville	80	22	51.8	1.73	
Knickerbocker	78	13	47.2	0.45	
Kopperl	......	......	......	0.30	
Lampasas	78	18	47.3	1.24	
Lapara	......	......	......	0.82	
Liberty	......	......	......	2.90	
Llano	76	22	45.8	1.50	
Longlake	......	......	......	3.38	
Longview	77	21	45.7	5.80	
Luling	78	26	52.2	1.43	
McKinney	73	22	48.1	0.36	
Mann	78	17	50.4	0.66	
Marlin	76	22	48.6	1.05	
Menardville	72	10	44.8	0.40	
Mexia	77	22	50.6	1.59	
Midland	68	12	41.7	0.05	0.5
Mount Blanco	78	10	40.4	0.30	3.0
Nacogdoches	81	23	49.6	8.03	
New Braunfels	81	25	52.4	1.27	
Orange	......	......	......	3.00	
Panter	......	......	......	T.	
Paris	79	8	49.2	0.81	
Pearsall	81	26	54.6	0.62	
Pecos	79	19	48.1	0.05	0.5
Port Lavaca	82	25	55.5	2.66	
Quanah[k]	70	20	39.4	......	
Rhineland	75	15	41.6	0.30	3.0
Riverside	......	......	......	7.26	
Rockisland	81	25	54.0	2.64	
Rockland	82	40	56.8	10.09	
Rockport	76	40	56.8	7.60	
Runge	80[e]	26[e]	54.2[e]	6.08	
Sabinal	92	21	50.9	0.80	
San Marcos	80	24	51.1	1.33	
San Saba	74	17	48.3	0.65	
Santa Gertrude	......	......	......	1.12	
Sherman	72	22	48.7	T.	
Sonora	73	12	45.8	0.18	
Sugarland	77	25	51.8	7.17	
Sulphur Springs	76	19	47.2	1.73	T.
Temple *a*	77	20	48.0	0.98	
Temple *b*	77	21	48.8	0.91	
Texline	......	......	......	0.75	7.5
Tilden	90	19	57.9	1.08	
Trinity	84	22	52.6	6.85	
Tulia	77	7	38.4	0.55	4.0
Tyler	78	21	48.1	2.31	
Victoria	83[e]	28	54.8[b]	1.59	
Waco	86	24	51.4	0.29	
Waxahachie	76	19	48.4	0.65	
Weatherford	74	18	45.2	0.41	
Wichita Falls	......	......	......	0.00	
Utah.					
Alpine	......	......	......	1.33	......
Aneth	57	6	31.5	0.28	T.
Beaver	70	− 9	31.6	0.40	4.0
Blackrock	55	−14	27.5	0.55	5.5
Callao	59	− 6	27.4	0.05	0.5
Castledale	55	−12	22.8	......	......
Castle Rock	......	......	......	1.50	15.0
Corinne	58	− 8	31.2	1.00	10.0
Coyoto	56	−18	23.4	0.40	4.0
Deseret	58	−16	26.7	0.77	13.0
Emery	47	− 2	22.4	0.40	4.0
Ex. Farm	65	9	36.0	......	......
Farmington	52	1	30.0	1.57	12.5
Fillmore	63	− 7	34.2	0.95	......
Fort Duchesne	51	− 9	22.0	0.07	0.7
Frisco	59	2	35.0	0.22	2.2
Garrison	58	4	31.8	0.22	2.1
Giles	54	− 4	28.8	0.50	T.
Government Creek	52	− 3	29.8	0.62	6.5
Grayson	61	7	30.6	0.53	5.5
Green River	50	− 4	29.8	0.05	......
Heber	54	−24	22.4	1.91	24.0
Henefer	55	−25	24.7	1.57	11.8
Hite	76	14	36.9	0.25	......
Huntsville	......	......	......	2.12	17.0
Ibapah	65	− 9	26.4	0.20	2.0
Indianola	......	......	......	0.84	......
Kanab	58	1	30.4	0.10	1.0
Kelton	49	− 6	24.0	0.30	3.0
La Sal	50	− 6	27.5	0.80	8.0
Levan	54	−11	26.6	1.52	15.9
Loa	60	−14	24.4	0.00	
Logan	56	−12	28.6	0.90	......
Manti	58	−15	23.6	1.50	15.0
Marysvale	58	−14	27.9	0.41	7.2
Meadowville	49	− 9	25.9	1.30	11.0
Millville	......	......	......	0.91	......
Minersville	54	− 5	31.4	0.80	8.0
Moab	57	4	31.4	0.29	2.0
Morgan	49	−25	24.0	1.47	13.5
Mount Nebo	59	− 4	30.8	0.24	1.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Pleasant	55	— 8	28.0	1.90	19.0
Nephi				1.10	9.5
Ogden	48	0	30.0	1.47	9.8
Panquitch				0.20	2.0
Parowan	55	— 7	29.6	0.79	9.5
Payson				0.49	4.9
Pinto	60	— 5	28.0	0.17	2.0
Plateau	63	0	29.9		
Promontory*[1]	55	—15	23.0	0.65	6.5
Provo	54	— 6	29.8	1.05	8.6
Ranch	66	— 3	31.2	0.10	
Randolph				0.23	4.0
Richfield	61[b]	—13[b]	26.4[b]	0.80	8.0
Rockville	81	16	44.9	0.29	
St. George	67	10	41.2	0.17	
Salt Air	54	2	30.8	0.29	3.0
Scipio	61	—21	29.4	1.99	15.0
Snowville	52	—18	23.8	0.90	9.0
Soldier Summit	50	—20	18.0	0.66	10.0
Thistle	57	—20	24.8	1.50	15.0
Tooele	55	5	31.5	0.65	
Tropic	58	1	31.9	0.10	1.0
Utah Lake				0.53	4.0
Vermont.					
Burlington	40	—14	16.0	1.63	8.5
Cavendish	46	— 9	15.8	1.77	
Chelsea	42	—13	11.6	1.36	16.0
Chittenden				1.67	
Cornwall	44	—11	15.8	1.49	6.4
Enosburg Falls	47	—33	12.0	1.71	13.5
Jacksonville	32	—19	14.0	3.11	43.3
Manchester	45	— 8	17.2	2.13	9.5
Morrisville	44	—22	11.2	2.60	21.7
Norwich	45	—14	11.8	2.05	11.0
St. Johnsbury	42	—22	11.8	1.63	12.2
Wells	40	— 9	14.6	1.93	11.5
Woodstock	46	—16	13.4	1.54	19.0
Virginia.					
Ashland	63	1	32.2	3.16	10.0
Barboursville	62	— 2	33.9	3.42	11.5
Bedford	65	11	34.4		6.5
Bigstone Gap	65	12	37.4	5.12	4.5
Blacksburg	60	4	33.6	3.12	6.5
Buchanan				3.00	0.7
Buckingham	65	0	33.9		
Burkes Garden	58	6	32.2	4.38	1.0
Callaville	70	10	37.4	4.71	7.0
Charlottesville	65	15	37.0	2.82	7.0
Clarksville				3.55	6.0
Columbia	63	0	32.4	3.79	8.0
Dale Enterprise	58	0	31.4	2.38	7.0
Danville				3.02	2.5
Dinwiddie	69[e]	2[e]	33.8[e]	5.18	6.2
Elk Knob	59	8	36.4	5.95	6.0
Farmville	58	10	33.8	1.60	5.3
Fredericksburg	62	9	31.6	3.85	14.2
Hampton	63	19	37.6	6.36	6.0
Hot Springs	59	— 1	31.0	2.54	4.5
Howardsville				2.80	3.0
Ivanhoe				2.52	
Lexington	61	1	33.0	2.71	7.8
Lincoln	61	— 7	26.8	2.04	11.0
McDowell	58	— 9	29.0	1.52	12.8
Mendota				4.46	2.0
Newport News	65	18	38.4	5.86	6.3
Petersburg	62	10	35.2	5.24	10.8
Radford				1.20	4.0
Riverton				2.03	8.0
Roanoke	65	9	37.4	3.21	7.8
Rockymount				3.43	6.5
Saxe	65	11	35.8	3.16	4.2
Shenandoah				1.20	4.2
Speers Ferry				5.75	5.0
Spottsville	68	8	36.4	4.42	8.5
Staunton	62	1	34.0	2.42	7.0
Stephens City	62	2	30.8	3.77	15.0
Warsaw	65[b]	6[b]	31.4[b]	2.58	9.0
Wilkerson	65	8	33.2	4.32	14.1
Williamsburg	65	9	35.6	7.45	11.8
Woodstock	62	0	30.9	2.73	9.4
Wytheville	65	11	35.2	2.58	1.6
Washington.					
Aberdeen	57	30	41.8	11.89	2.0
Anacortes				2.54	
Ashford				11.25	17.0
Bellingham	57	26	44.0	3.11	T.
Blaine	56	26	41.9	8.29	2.0
Brinnon	52	27	40.3	11.86	4.0
Cedonia	45	13	30.8	1.12	11.1
Centralia	61	27	42.4	7.15	T.
Cheney	56	14	33.0	2.42	10.0
Clearbrook	57	24	39.9	8.29	
Clearwater	53	29	41.4	20.92	9.0
Cle Elum	50	17	32.2	3.89	19.0
Colville	45	4	29.6	1.90	17.8
Conconully	46	3	27.0	2.33	19.9
Coupeville	55	30	43.6	2.36	T.
Crescent	46	10	30.2	2.08	10.0
Washington—Cont'd.					
Cusick	52	— 1	30.3	2.97	13.7
Danville	45	7	29.2	1.35	12.7
Dayton	59	16	36.8	2.59	2.5
East Sound	57	25	41.7	5.76	
Ellensburg	48	15	30.8	1.44	9.0
Ephrata	51	13	32.6	1.40	6.0
Grandmound	54	26	41.0	8.09	T.
Granite Falls				7.36	
Horseheaven				0.61	2.0
Ilwaco	59	32	45.2	14.60	
Lacenter	54	24	40.6	8.03	0.5
Lakeside	48	13	32.2	1.87	20.0
Lester	48	18	36.0	7.74	13.5
Lind	48	19	34.4	1.13	1.7
Mottinger Ranch	59	23	38.6	1.47	
Mount Pleasant	60	31	41.0	8.02	T.
Moxee	55	12	32.6	0.77	1.3
Northport	45	7	30.3	2.18	21.8
Odessa	51	15	33.6	1.31	
Olga	59	29	43.1	4.10	T.
Olympia	54	24	41.4	8.32	T.
Pinehill	56	22	37.7	4.03	1.5
Pomeroy	55	15	36.0	2.14	2.0
Port Townsend	53	32	43.7	2.69	3.5
Pullman	48	16	34.2	2.36	3.7
Rattlesnake	53[d]	14[d]	32.3[d]	1.67	2.5
Republic	45	1	27.8	1.79	13.0
Ritzville				1.52	
Ritzville (near)				1.58	0.5
Rosalia	44	18	33.2	2.34	4.2
Sedro	55	28	41.5	5.39	3.0
Snohomish	52	25	42.0	6.83	T.
Snoqualmie	52	27	41.2	8.82	
Southbend	70	30	43.6	11.14	
South Ellensburg	44	16	31.8	1.26	13.0
Sprague				2.90	2.0
Sunnyside	56	14	33.8	0.55	T.
Trinidad	52	12	32.6	1.25	12.5
Twisp	46	0	25.6	2.64	31.0
Union	54	24	40.4	15.36	2.7
Vancouver	58	27	42.2	6.82	
Vashon	54	32	43.1	6.08	
Wahluke	53	15	34.8	0.74	T.
Waterville	49	5	27.9	1.43	13.0
Wenatchee (near)	48	10	29.3	2.25	20.1
Wilbur	42	3	29.1	1.68	6.3
Zindel	53[d]	20[d]	38.4[d]	1.25	
West Virginia.					
Bancroft	67	2	36.0	1.82	7.5
Bayard	60	— 8	27.4	3.95	16.1
Bens Run	64	0	32.4	3.02	13.0
Beverly	64	— 6	28.0	3.34	13.0
Bluefield	62	9	34.9	0.95	8.0
Buckhannon	69	— 5	33.2	3.87	18.0
Burlington	60	— 7	28.6	2.68	13.0
Cairo	66	—12	31.6	3.03	13.0
Central	65	—13	31.8	3.37	9.2
Charleston	70	2	38.8	2.73	
Creston	65	—11	32.2	1.63	8.0
Cuba	67	— 8	32.1	2.91	12.0
Doane	65	8	36.0	3.72	
Elkhorn	66	12	36.4	5.63	3.8
Fairmont				2.98	9.5
Glenville	70	—11	34.4	2.95	11.0
Grafton	71	— 3	32.8	2.93	11.3
Green Sulphur Springs	67	9	32.4	1.69	
Hamlin	69	— 4	34.0	2.45	1.0
Harpers Ferry				2.58	15.1
Hinton				2.87	3.5
Huntington	65	7	34.4	3.66	7.0
Leonard	53	6	29.4	5.33	12.0
Lewisburg	60	1	32.2	3.27	4.0
Logan	70	13	38.4	4.06	10.0
Lost Creek	65	—16	28.4	2.77	6.5
Mannington	69	—14	31.3	2.54	9.0
Martinsburg	51	— 1	27.7	2.35	20.0
Moorefield	65	— 8	32.4	2.70	11.0
Morgantown	70	1	31.6	2.56	9.0
Moundsville	67	— 6	33.0	2.99	11.1
New Cumberland	64	— 5	28.3	2.45	6.5
New Martinsville	66	— 3	32.6	3.09	10.5
Nuttallburg	78	10	40.6	0.87	4.0
Parsons	65[e]	— 6[e]	29.8[e]	4.40	13.0
Philippi	71	—14	31.6	4.29	10.0
Pickens	60	1	29.8	5.91	16.0
Point Pleasant	68	2	36.1	2.88	9.0
Princeton	62	8	35.2	5.90	9.5
Romney	60	— 6	31.2	2.72	10.0
Rowlesburg				4.26	12.4
Ryan	67	—14	33.1	2.52	10.8
Smithfield	69	—11	31.5	3.00	11.5
Southside	68	— 3	34.9	2.00	11.6
Terra Alta	60	7	34.0	4.37	16.2
Uppertract	61	— 5	32.6	2.51	7.0
Valley Fork	70	— 5	36.3	2.81	10.2
Wellsburg	64	1	28.0	3.05	10.5
Weston	70	—20	33.8	4.16	
Wheeling *a*				1.99	12.0
West Virginia—Cont'd.					
Wheeling *b*	66	0	34.6	1.39	7.0
Williamson	69	12	37.6	3.30	2.0
Wisconsin.					
Amherst	44	—15	17.6	1.50	12.0
Antigo	45	—11	16.6	2.70	27.0
Appleton	43	— 7	20.4	1.74	16.0
Appleton Marsh	46	—17	18.4	2.17	21.5
Ashland				1.68	
Barron	48	—12	15.2	0.90	9.0
Beloit	49	—15	22.2	2.51	14.5
Berlin	44	—11	18.4		
Brodhead	50	—24	21.3	3.00	22.0
Burnett	45	—14	19.4	2.01	11.5
Butternut	49	—20	14.6	2.48	24.9
Chilton	47	—11	19.5	2.78	19.3
Darlington	52	—29	18.4	1.42	13.0
Easton	41	—22	17.3	1.76	16.2
Eau Claire	46	—12	18.8	1.68	17.0
Florence	48	— 8	15.8	2.19	21.5
Fond du Lac	45	—18	19.3	1.71	11.0
Grand Rapids	44	—15	17.8	1.24	12.5
Grand River Locks				1.18	15.5
Grantsburg	50	—19	17.4	1.50	15.0
Hancock	42	—20	18.0	2.20	22.0
Hayward	46	—20	14.2	1.14	10.9
Hillsboro	49	—24	18.1	2.30	23.0
Koepenick	48	—17	16.2	2.40	23.0
Lancaster	51	—15	19.4	1.87	18.5
Manitowoc	43	— 3	22.4	2.40	29.8
Meadow Valley	48	—17	17.6	1.48	17.0
Medford	47	—11	18.4	2.90	29.0
Menasha				1.41	19.0
Minocqua	47	—15	16.2	2.25	18.0
Mount Horeb	50	— 8	18.4	2.65	14.3
Neillsville	42	—20	18.2	3.31	33.1
New London	44	—15	18.2	1.93	15.0
New Richmond	46	—10	18.4	0.50	5.0
Oconto	47	— 7	19.5	1.75	17.5
Osceola	48	—12	16.8	0.50	5.0
Oshkosh	43	— 8	18.9	2.16	12.0
Pine River	48	—13	19.3	1.66	18.9
Portage	47	—14	20.2	1.82	13.0
Port Washington	50	— 7	19.4	2.40	15.0
Prairie du Chien *a*	54	—16	24.6	2.40	18.1
Prairie du Chien *b*				2.09	15.2
Prentice	49	—17	17.7	1.83	23.0
Racine	50	5	25.4	1.80	
Sheboygan	47	3	24.0	1.70	15.5
Spooner	47	—16	15.6	0.49	10.0
Stanley	48	—14	17.2	1.63	17.2
Stevens Point	48	—19	19.9	1.00	10.0
Tomahawk				1.95	15.0
Valley Junction	48	—17	19.4	2.82	
Viroqua	46	— 9	19.0	2.40	21.5
Watertown	49	—14	18.8	2.30	18.8
Waukesha	49	— 1	21.4	1.38	12.0
Waupaca	43	—13	17.6	1.38	18.0
Whitehall	58	—17	19.4	0.82	8.2
Wyoming.					
Afton	52	—24	22.8	1.03	11.0
Alcova	52	—12	29.0	0.11	2.0
Basin	53	—15	24.6	0.01	
Bedford	46	—28	22.0	1.64	16.4
Border	46	—32	18.1	0.58	
Buffalo	62	—15	25.6	0.25	2.5
Cambria	52	—12	26.4	0.90	9.0
Centenial				0.30	3.0
Daniel	50	—20	17.6	0.55	5.5
Embar	56	—12	27.4	0.70	7.0
Evanston	51	—20	24.0	0.53	5.0
Fontenelle	48	—28	18.2	0.75	7.5
Fort Laramie	62	0	30.8	0.21	1.7
Fort Washakie	57	—13	25.2	0.18	1.8
Gillette	50	—12	27.3	0.50	6.0
Granite Canyon				0.30	3.0
Green River	52[e]	—18[e]	22.8[e]		
Griggs	61	—31	27.6	0.92	9.2
Hyattville	60	—20	29.2	0.60	6.0
Iron Mountain	56	— 2	28.0	0.05	0.5
Kirtley	60	—10	27.4	0.15	2.2
Laramie	53	—11	26.2	0.08	1.0
Leo	47	—21	24.2	0.35	4.5
Little Medicine	47	—18	19.2	0.53	12.0
Lolabama Ranch	47	—10	24.4	0.01	
Lusk	60	—12	26.7	0.30	3.0
Marquette	60	—15	32.1	T.	T.
Meeteetse	47	— 9	21.9	0.10	2.0
Moore	56	— 1	29.9	0.12	
Moorcroft	54	—21	25.3	0.60	6.0
Phillips	67	— 5	33.1	0.20	2.0
Pine Bluff	68	— 4	31.8	T.	T.
Red Bank	62	—17	24.1	2.04	18.0
Rock Springs	45	— 7	24.2		
Sheridan	67	—12	28.8	0.60	6.0
South Pass City	54	—28	16.8	0.60	6.0
Story	68			2.55	25.5
Thayne	48	—30	20.3	1.38	14.8
Wells	43	—15	16.8	1.11	16.0

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for November*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Yellowstone Park (C. H.)	42	—26	15.4	1.44	30.5
Yellowstone Pk. (Foun'n)	40	......	......	2.30	23.0
Yellowstone Pk. (Lake)	40	—18	18.0	1.60	16.0
Yellowstone Pk. (U. Ba'n)	43	—32	18.4	2.80	30.5
Yellowstone Pk. (Soda B.)	42	—27	16.9	1.80	16.0
Porto Rico.					
Adjuntas	88	50	70.5	0.90	
Aguirre	92	63	78.4	0.93	
Aricebo	86	55	74.1	2.65	
Bayamon	90	59	75.5	2.60	
Caguas	87	56	72.9	2.58	
Canovanas	84	66	76.2	3.20	
Corozal	93	60	......	2.50	
Fajardo	89	62	76.8	2.73	
Guanica	91	58	75.0	0.55	
Hacienda Colosa	90	58	75.1	1.94	
Hacienda Josefa	......	......	......	1.00	
Humacao	87	72	79.8	3.75	
Isabela	87	63	75.0	1.70	
Juana Diaz	92	66	79.6	T.	
La Carmelita	85	60	73.6	8.42	
Lares	87	55	71.8	3.46	
Manati	92	60	75.6	1.41	
Maunabo	90	64	77.6	1.10	
Mayagues	92	61	76.2	3.80	
Morovis	91	58	74.1	4.90	
Ponce	90	65	78.0	0.05	
Rio Blanco	87	62	75.8	3.07	
Rio Piedras	......	......	......	2.54	
San German	88	60	75.1	5.95	
San Lorenzo	87	56	73.0	2.01	
San Salvador	84	59	71.6	2.39	
Santa Isabel	87	60	75.3	0.52	
Vieques	95	70	78.6	1.88	
Yauco	83	63	74.2	1.58	
New Brunswick.					
St. John	43	— 6	15.5	2.04	12.3

Late reports for November, 1904.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.	°	°	°	*Ins.*	*Ins.*
Coal Harbor	43	17	31.6	2.83	3.2
Alaska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Kenai	39	—21	17.6	0.48	3.2
Wood Island	52	12	34.7	5.20	......
Arizona.					
Alpine	......	......	......	0.00	
Pinal Ranch	......	......	......	0.00	
Arkansas.					
Batesville	79	23	49.8	0.36	
California.					
Meadow Valley	......	......	......	4.46	4.0
San Miguel Island	......	......	......	0.10	
Georgia.					
Bainbridge	77[c]	30[b]	54.3[c]	3.40	
Iowa.					
Earlham	72	7	40.2	0.13	T.
Fayette	70	7	35.9	T.	T.
Greenfield	70	8	42.1	0.24	0.3
Lenox	68	11	42.2	0.11	T.
Ottumwa	78	16	44.6	0.13	
Kansas.					
Anthony	......	......	......	0.15	1.5
Madison	76	13	46.4	0.13	0.5
Viroqua[1]	74	12	45.2	T.	T.
Minnesota.					
Two Harbors	70	— 5	35.6	0.00	
Willow River	68	— 8	34.6	0.30	0.9
Nebraska.					
Lynch	......	......	......	0.00	
New Hampshire.					
Jefferson Highland	......	......	......	1.38	16.0
New Mexico.					
Dorsey	70	8	42.9	T.	T.
New York.					
Caldwell	54	8	32.9	0.70	4.5
Rhode Island.					
Pawtucket	58	11	36.6	2.20	0.1
Texas.					
San Marcos	77	30	59.3	0.33	
Santa Gertrude	......	......	......	1.10	
Utah.					
Blacksmith Fork	......	......	......	0.00	
Porto Rico.					
Bayamon	90	60	77.2	2.45	
Mexico.					
Vera Cruz	83	56	72.8	3.01	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

October, 1904, Minnesota, Angus, make mean temperature 44.9° instead of 44.8°; Luverne, make total precipitation 5.13 instead of 5.03. November, 1904, Colorado, Fort Morgan, make total precipitation 0.05 instead of T; Trinidad, make total precipitation 0.05 instead of T. California, Georgetown, make total precipitation 2.53 instead of 2.05.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of December, 1904.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	29	5	6	36	n. 51 w.	38
Portland, Me	27	12	0	39	n. 69 w.	42
Concord, N. H.†	19	3	3	14	n. 34 w.	19
Northfield, Vt	29	26	7	9	n. 34 w.	4
Boston, Mass	26	13	4	36	n. 68 w.	34
Nantucket, Mass	22	8	12	33	n. 56 w.	25
Block Island, R. I	25	10	9	32	n. 57 w.	28
Narragansett, R. I.*	12	5	7	16	n. 52 w.	11
Providence, R. I	31	7	6	31	n. 46 w.	35
Hartford, Conn	32	18	2	22	n. 55 w.	24
New Haven, Conn	32	12	12	24	n. 31 w.	23
Middle Atlantic States.						
Albany, N. Y	28	21	9	14	n. 36 w.	9
Binghamton, N. Y.†	10	3	7	14	n. 45 w.	10
New York, N. Y	28	7	10	32	n. 46 w.	30
Harrisburg, Pa	15	12	16	30	n. 78 w.	14
Philadelphia, Pa	27	13	10	27	n. 51 w.	22
Scranton, Pa	22	19	16	24	n. 69 w.	8
Atlantic City, N. J	25	9	11	32	n. 53 w.	26
Cape May, N. J	30	12	8	25	n. 43 w.	25
Baltimore, Md	25	13	12	26	n. 49 w.	18
Washington, D. C	24	20	11	19	n. 63 w.	9
Cape Henry, Va.†	11	12	5	10	s. 79 w.	5
Lynchburg, Va	19	18	16	30	n. 86 w.	14
Mount Weather, Va.	20	14	16	30	n. 67 w.	15
Norfolk, Va	28	16	10	23	n. 47 w.	18
Richmond, Va	24	20	6	25	n. 78 w.	19
Wytheville, Va	6	9	15	37	s. 82 w.	22
South Atlantic States.						
Asheville, N. C	26	20	11	18	n. 49 w.	9
Charlotte, N. C	16	21	18	22	s. 39 w.	6
Hatteras, N. C	31	9	10	26	n. 36 w.	27
Raleigh, N. C	24	14	11	25	n. 54 w.	17
Wilmington, N. C	24	10	16	29	n. 43 w.	19
Charleston, S. C	19	11	15	28	n. 58 w.	15
Columbia, S. C	16	16	19	26	w.	7
Augusta, Ga	17	16	16	30	n. 86 w.	14
Savannah, Ga	18	13	13	30	n. 74 w.	18
Jacksonville, Fla	22	17	13	22	n. 61 w.	10
Florida Peninsula.						
Jupiter, Fla	28	13	13	26	n. 41 w.	20
Key West, Fla	32	9	30	9	n. 42 e.	31
Sand Key, Fla.†	15	6	15	4	n. 51 e.	14
Tampa, Fla	29	10	20	18	n. 6 e.	19
Eastern Gulf States.						
Atlanta, Ga	21	14	16	26	n. 55 w.	12
Macon, Ga.†	12	9	6	12	n. 63 w.	7
Pensacola, Fla.†	14	4	8	10	n. 11 w.	10
Birmingham, Ala.†	6	8	9	13	s. 63 w.	4
Mobile, Ala	22	22	12	18	w.	6
Montgomery, Ala	14	20	18	24	s. 45 w.	8
Meridian, Miss.†	11	7	7	16	n. 66 w.	10
Vicksburg, Miss	16	26	18	16	s. 11 e.	10
New Orleans, La	25	18	18	15	n. 23 e.	8
Western Gulf States.						
Shreveport, La	15	24	21	19	s. 13 e.	9
Fort Smith, Ark	13	9	26	23	n. 37 e.	5
Little Rock, Ark	17	23	12	24	s. 63 w.	13
Corpus Christi, Tex	32	15	16	9	n. 22 e.	18
Fort Worth, Tex	16	28	4	26	s. 61 w.	25
Galveston, Tex	24	21	16	11	n. 59 e.	6
Palestine, Tex	17	25	9	7	s. 14 e.	8
San Antonio, Tex	25	20	14	18	n. 39 w.	6
Taylor, Tex.†	11	13	5	8	s. 56 w.	4
Ohio Valley and Tennessee.						
Chattanooga, Tenn	17	22	14	24	s. 63 w.	11
Knoxville, Tenn	19	25	7	29	s. 75 w.	23
Memphis, Tenn	18	24	12	20	s. 53 w.	10
Nashville, Tenn	16	29	9	20	s. 40 w.	17
Lexington, Ky.†	7	15	4	10	s. 37 w.	10
Louisville, Ky	17	25	10	23	s. 58 w.	15
Evansville, Ind.†	9	13	6	9	s. 37 w.	5
Indianapolis, Ind	24	21	13	17	n. 53 w.	5
Cincinnati, Ohio	18	19	19	26	s. 82 w.	7
Columbus, Ohio	17	23	15	23	s. 53 w.	10
Pittsburg, Pa	25	16	13	27	n. 57 w.	17
Parkersburg, W. Va	24	20	5	21	n. 76 w.	16
Elkins, W. Va	17	14	0	41	n. 86 w.	41
Lower Lake Region.						
Buffalo, N. Y	11	14	19	28	s. 72 w.	10
Oswego, N. Y	14	31	18	14	s. 13 e.	18
Rochester, N. Y	6	23	13	34	s. 51 w.	27
Syracuse, N. Y	17	25	11	21	s. 51 w.	13
Erie, Pa	15	22	14	23	s. 52 w.	11
Cleveland, Ohio	17	27	16	20	s. 22 w.	11
Sandusky, Ohio†	7	10	6	17	s. 75 w.	11
Toledo, Ohio	22	20	11	25	n. 82 w.	14
Detroit, Mich	22	19	14	24	n. 73 w.	10
Upper Lake Region.						
Alpena, Mich	17	14	10	32	n. 82 w.	22
Escanaba, Mich	25	13	8	33	n. 64 w.	28
Grand Rapids, Mich.	16	23	19	16	s. 23 e.	8
Houghton, Mich.†	12	5	10	11	n. 8 w.	7
Marquette, Mich	14	17	9	33	s. 83 w.	24
Port Huron, Mich	11	23	15	27	s. 45 w.	17
Sault Ste. Marie, Mich	18	15	31	11	n. 81 e.	20
Chicago, Ill	18	17	15	27	n. 85 w.	12
Milwaukee, Wis	21	11	9	34	n. 68 w.	27
Green Bay, Wis	24	22	7	26	n. 84 w.	19
Duluth, Minn	20	15	8	36	n. 80 w.	28

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
North Dakota.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Moorhead, Minn	28	20	11	17	n. 37 w.	10
Bismarck, N. Dak	18	17	21	20	n. 45 e.	1
Devils Lake, N. Dak	21	20	12	24	n. 85 w.	12
Williston, N. Dak.	17	23	16	24	s. 53 w.	10
Upper Mississippi Valley.						
Minneapolis, Minn.*	12	12	5	7	w.	2
St. Paul, Minn	24	23	12	15	n. 72 w.	3
La Crosse, Wis.†	13	12	5	7	n. 63 w.	2
Madison, Wis	22	16	13	22	n. 56 w.	11
Charles City, Iowa	21	16	21	20	n. 11 e.	5
Davenport, Iowa	18	13	17	23	n. 50 w.	8
Des Moines, Iowa	21	18	14	25	n. 75 w.	11
Dubuque, Iowa	26	16	12	23	n. 48 w.	15
Keokuk, Iowa	21	18	16	24	n. 69 w.	8
Cairo, Ill	19	28	5	19	s. 57 w.	17
La Salle, Ill	11	7	8	14	n. 56 w.	7
Springfield, Ill	21	22	15	17	s. 63 w.	2
Hannibal, Mo.†	9	7	7	13	n. 72 w.	6
St. Louis, Mo	18	23	21	15	s. 50 e.	8
Missouri Valley.						
Columbia, Mo.*	10	9	7	9	n. 63 w.	2
Kansas City, Mo	24	21	15	20	n. 59 w.	6
Springfield, Mo	17	23	13	22	s. 56 w.	11
Topeka, Kans.*	12	9	7	9	n. 34 w.	4
Lincoln, Nebr	24	22	13	17	n. 63 w.	4
Omaha, Nebr	21	23	12	21	s. 77 w.	9
Valentine, Nebr	19	11	10	33	n. 71 w.	24
Sioux City, Iowa †	11	13	5	8	s. 56 w.	4
Pierre, S. Dak	19	8	29	18	n. 45 e.	16
Huron, S. Dak	22	23	18	17	s. 45 e.	1
Yankton, S. Dak.†	11	9	9	8	n. 27 e.	2
Northern Slope.						
Havre, Mont	15	12	14	34	n. 81 w.	20
Miles City, Mont	18	18	11	25	w.	14
Helena, Mont	12	21	3	42	s. 77 w.	40
Kalispell, Mont	11	15	4	46	s. 85 w.	42
Rapid City, S. Dak	20	9	9	34	n. 66 w.	27
Cheyenne, Wyo	32	5	3	38	n. 52 w.	44
Lander, Wyo	24	16	7	30	n. 71 w.	24
Yellowstone Park, Wyo	8	44	4	17	s. 20 w.	38
North Platte, Nebr	14	16	9	34	s. 85 w.	24
Middle Slope.						
Denver, Colo	18	31	8	12	s. 17 w.	14
Pueblo, Colo	22	17	16	23	n. 54 w.	9
Concordia, Kans	21	26	9	19	s. 63 w.	11
Dodge, Kans	23	17	11	23	n. 63 w.	13
Wichita, Kans	26	21	14	15	n. 11 w.	5
Oklahoma, Okla	26	21	8	20	n. 67 w.	13
Southern Slope.						
Abilene, Tex	15	33	12	18	s. 18 w.	19
Amarillo, Tex	20	24	3	30	s. 82 w.	27
Southern Plateau.						
El Paso, Tex	23	2	14	34	n. 44 w.	9
Santa Fe, N. Mex	41	5	28	7	n. 30 e.	42
Flagstaff, Ariz	27	8	13	20	n. 20 w.	20
Phoenix, Ariz	11	10	38	14	n. 88 e.	24
Yuma, Ariz	40	6	15	8	n. 12 e.	35
Independence, Cal	22	18	14	24	n. 68 w.	11
Middle Plateau.						
Carson City, Nev	18	19	19	19	s.	1
Winnemucca, Nev	26	15	24	17	n. 32 e.	13
Modena, Utah	7	1	17	39	n. 75 w.	23
Salt Lake City, Utah	25	12	19	26	n. 28 w.	15
Grand Junction, Colo	31	12	17	17	n.	19
Northern Plateau.						
Baker City, Oreg	10	31	27	15	s. 30 e.	24
Boise, Idaho	18	24	12	22	s. 59 w.	12
Lewiston, Idaho†	3	6	16	7	s. 72 e.	10
Pocatello, Idaho	2	19	29	22	s. 22 e.	18
Spokane, Wash	12	30	15	19	s. 13 w.	18
Walla Walla, Wash	8	41	8	12	s. 7 w.	33
North Pacific Coast Region.						
North Head, Wash	7	21	31	12	s. 54 e.	24
Port Crescent, Wash.*	6	14	15	7	s. 45 e.	11
Seattle, Wash	10	27	35	5	s. 60 e.	34
Tacoma, Wash	6	39	10	29	s. 30 w.	38
Tatoosh Island, Wash	1	23	29	17	s. 29 e.	25
Portland, Oreg	10	25	22	19	s. 11 e.	15
Roseburg, Oreg	14	28	14	19	s. 20 w.	15
Middle Pacific Coast Region.						
Eureka, Cal	12	26	16	14	s. 8 e.	14
Mount Tamalpais, Cal	31	10	20	19	n. 3 e.	21
Red Bluff, Cal	28	17	19	14	n. 24 e.	12
Sacramento, Cal	21	22	24	9	s. 86 e.	15
San Francisco, Cal	31	7	15	20	n. 12 w.	24
Point Reyes Light, Cal.*	14	7	4	14	n. 55 w.	12
Southeast Farallon, Cal.*	18	3	8	11	n. 11 w.	15
South Pacific Coast Region.						
Fresno, Cal	28	16	15	19	n. 18 w.	13
Los Angeles, Cal	25	10	21	25	n. 15 w.	16
San Diego, Cal	25	10	23	20	n. 11 e.	15
San Luis Obispo, Cal	40	9	11	10	n. 2 e.	31
West Indies						
Grand Turk, W. I.†	5	3	25	2	n. 85 e.	23
Hamilton, Bermuda	21	16	7	30	n. 78 w.	24
Havana, Cuba†	8	7	20	2	n. 87 e.	18
San Juan, Porto Rico	1	35	34	5	s. 41 e.	45

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, December, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	60	T.																1	1							1		1	12	2				18	6	T.
		A.																																0	0	A.
Arizona	56	T.			2				1																1									4	3	T.
		A.																																0	0	A.
Arkansas	57	T.		2																						2		2	1					7	4	T.
		A.																																0	0	A.
California	167	T.									1		2											1										4	3	T.
		A.																																0	0	A.
Colorado	70	T.																																0	0	T.
		A.													1																			1	1	A.
Connecticut	21	T.																																0	0	T.
		A.																																0	0	A.
Delaware	5	T.																																0	0	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.																																0	0	T.
		A.																																0	0	A.
Florida	61	T.		1												1	2												2	1				7	5	T.
		A.																																0	0	A.
Georgia	67	T.	1																	1								1	7					10	4	T.
		A.																																0	0	A.
Idaho	34	T.																																0	0	T.
		A.																																0	0	A.
Illinois	84	T.																							1	1	2	13	1					18	5	T.
		A.						1	1	1																				1	3	1		8	6	A.
Indiana	58	T.																							1	2	1	12						16	4	T.
		A.																						1										1	1	A.
Indian Territory	20	T.																																0	0	T.
		A.																																0	0	A.
Iowa	128	T.																										1						1	1	T.
		A.																																0	0	A.
Kansas	88	T.									2																	2						4	2	T.
		A.																						2	1				1					4	3	A.
Kentucky	41	T.																									1	1	1					3	3	T.
		A.																																0	0	A.
Louisiana	46	T.		5	4	3																			1		4	7	4					28	7	T.
		A.																																0	0	A.
Maine	25	T.																																0	0	T.
		A.																																0	0	A.
Maryland	42	T.																																0	0	T.
		A.											1																1					2	2	A.
Massachusetts	48	T.																																0	0	T.
		A.																																0	0	A.
Michigan	106	T.																											1					1	1	T.
		A.												1	1	1																		3	3	A.
Minnesota	67	T.																																0	0	T.
		A.																														1		1	1	A.
Mississippi	57	T.		2	1																					1		7	4					15	5	T.
		A.																																0	0	A.
Missouri	86	T.								1	1		1					1										16	2					22	6	T.
		A.																																0	0	A.
Montana	54	T.															1																	1	1	T.
		A.																																0	0	A.
Nebraska	137	T.																																0	0	T.
		A.			1																				1									2	2	A.
Nevada	40	T.																																0	0	T.
		A.																																0	0	A.
New Hampshire	21	T.																																0	0	T.
		A.																																0	0	A.
New Jersey	48	T.																																0	0	T.
		A.																																0	0	A.
New Mexico	31	T.																																0	0	T.
		A.																																0	0	A.
New York	129	T.																										2						2	1	T.
		A.																																0	0	A.
North Carolina	56	T.									1																		1					2	2	T.
		A.																																0	0	A.
North Dakota	48	T.																																0	0	T.
		A.	1																						1	1	1	1	1					6	6	A.
Ohio	101	T.	1																							1	12	3	1					18	5	T.
		A.																							1									1	1	A.
Oklahoma	36	T.									1				1																			2	2	T.
		A.																																0	0	A.
Oregon	70	T.									2		2												1						2	4		11	5	T.
		A.																																0	0	A.
Pennsylvania	91	T.																												1				1	1	T.
		A.		1																														1	1	A.
Rhode Island	6	T.																																0	0	T.
		A.																																0	0	A.
South Carolina	54	T.			1			1											5										2					9	4	T.
		A.																																0	0	A.
South Dakota	56	T.																																0	0	T.
		A.						1																				1	2	1				5	4	A.
Tennessee	56	T.																								2		6	12					20	3	T.
		A.																																0	0	A.
Texas	126	T.				3		1							1										4		1	5				3	2	20	8	T.
		A.																																0	0	A.
Utah	64	T.																								4								4	1	T
		A.																																0	0	A.
Vermont	12	T.																																0	0	T.
		A.																																0	0	A.
Virginia	40	T.																													1			1	1	T
		A.																																0	0	A
Washington	71	T.																												1	1	1		3	3	T
		A.																														1		1	1	A
West Virginia	47	T.																																0	0	T
		A.																																0	0	A
Wisconsin	63	T.											1																					1	1	T
		A.											1	1																		1		3	3	A
Wyoming	38	T.																																0	0	T
		A.																								1								1	1	A
Sums	2993	T.	2	10	8	6	0	2	1	1	8	0	6	0	2	1	3	2	6	1	0	0	0	1	9	14	21	79	51	5	4	8	2	253	....	T
		A.	1	1	1	0	0	2	1	1	0	0	2	2	1	2	0	0	0	0	0	0	0	3	4	2	1	2	5	2	3	4	0	40	....	A

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during December, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y	12-13			0.58														*			
Alpena, Mich	26-27			0.67														*			
Amarillo, Tex	4-5			0.47														*			
Asheville, N. C	27			0.40														0.17			
Atlanta, Ga	27			0.72														0.29			
Atlantic City, N. J	5			0.65														0.16			
Augusta, Ga	2			1.10														0.37			
Baltimore, Md	9-10			1.00														*			
Binghamton, N. Y	26-27			0.55														*			
Birmingham, Ala	27	7:15 a. m.	10:45 a. m.	1.58	7:20a. m.	7:51 a. m.	0.01	0.07	0.28	0.76	0.89	1.03	1.10								
Bismarck, N. Dak	25-26			0.68														*			
Block Island, R. I	27			0.69														*			
Boise, Idaho	24-25			0.76														*			
Boston, Mass	27-28			1.54														0.17			
Buffalo, N. Y	26-27			0.75														*			
Cairo, Ill	26-27			1.56														0.32			
Cape Henry, Va	11-12			0.53														0.23			
Charleston, S. C	5			0.45														0.10			
Charlotte, N. C	5			1.04														0.27			
Chattanooga, Tenn	27			1.06														0.65			
Chicago, Ill	26			0.28														*			
Cincinnati, Ohio	26-27			2.18														0.44			
Cleveland, Ohio	26-27			1.12														0.22			
Columbia, Mo	25-27			1.07														0.39			
Columbia, S. C	27			0.42														0.24			
Columbus, Ohio	26-27			1.42														*			
Concord, N. H	27-28			1.35														*			
Corpus Christi, Tex	30-31			1.97														0.59			
Davenport, Iowa	26-27			1.94														*			
Denver, Colo	25-26			1.37														*			
Des Moines, Iowa	26-28			1.22														*			
Detroit, Mich	26-27			1.02														*			
Dodge, Kans	3-4			0.56														*			
Dubuque, Iowa	26-27			1.43														0.16			
Duluth, Minn	26-28			0.30														*			
Eastport, Me	27-28			1.17														*			
Elkins, W. Va	26			0.60														0.16			
Erie, Pa	23-24			0.30														*			
Escanaba, Mich	27-28			0.98														*			
Evansville, Ind	26-27			1.78														0.25			
Fort Smith, Ark	23			0.11														0.10			
Fort Worth, Tex	4-5			0.36														0.13			
Fresno, Cal	†																				
Galveston, Tex	26-27			0.50														0.27			
Grand Junction, Colo	25			0.24														*			
Grand Rapids, Mich	27-28			0.58														*			
Green Bay, Wis	27-28			1.70														*			
Hannibal, Mo	16-17			0.37														*			
Harrisburg, Pa	17-18			0.46														*			
Hatteras, N. C	12			0.62														0.50			
Huron, S. Dak	15-16			0.18														*			
Indianapolis, Ind	26-27			2.75														0.45			
Jacksonville, Fla	14			1.17														0.26			
Jupiter, Fla	14			0.17					0.17												
Kalispell, Mont	29-30			0.34														*			
Kansas City, Mo	26-27			0.94														*			
Key West, Fla	15			0.33														0.16			
Knoxville, Tenn	27			1.14														0.51			
La Crosse, Wis	26-27			0.93														*			
Lewiston, Idaho	9			0.19														*			
Lexington, Ky	26-27			1.27														*			
Lincoln, Nebr	15-16			0.20														*			
Little Rock, Ark	23			2.00														0.46			
Los Angeles, Cal	31			1.69														0.45			
Louisville, Ky	26-27			1.98														0.39			
Lynchburg, Va	5			0.86														0.22			
Macon, Ga	27	1:15 p. m.	7:25 p. m.	0.97	2:21 p. m.	2:41 p. m.	T.	0.16	0.40	0.57	0.62										
Memphis, Tenn	23-24			3.36														0.68			
Meridian, Miss	26-27	9:00 p. m.	9:35 a. m.	1.16	5:21 a. m.	5:36 a. m.	0.12	0.26	0.46	0.54	0.58										
Milwaukee, Wis	11-12			1.20														*			
Minneapolis, Minn	26-27			0.48														*			
Montgomery, Ala	27			0.53														0.53			
Nantucket, Mass	17-18			1.15														0.26			
Nashville, Tenn	26-27			1.76														0.67			
New Haven, Conn	27-28			1.28														0.21			
New Orleans, La	27			1.02														0.45			
New York, N. Y	26-27			0.66														0.14			
Norfolk, Va	12			0.49														0.23			
Northfield, Vt	27-28			1.04														*			
North Head, Wash	22-23			1.18														0.40			
Oklahoma, Okla	†																				
Omaha, Nebr	15-16			0.30														0.12			
Palestine, Tex	25-26			3.54														0.73			
Parkersburg, W. Va	25			0.42														0.35			
Pensacola, Fla	1-2	5:40 p. m.	4:15 a. m.	2.26	2:57 a. m.	3:47 a. m.	1.06	0.20	0.50	0.73	0.78	0.86	0.91	0.93	0.93	1.02	1.16				
Do	4-5	8:10 a. m.	3:45 a. m.	2.83	1:55 p. m.	3:20 p. m.	0.18	0.12	0.26	0.41	0.48	0.56	0.60	0.67	0.73	0.80	0.88	0.93	1.16	1.27	
Philadelphia, Pa	†																				
Pittsburg, Pa	26-27			0.64														*			
Pocatello, Idaho	23-24			0.68														*			
Portland, Me	27			0.52														0.17			
Portland, Oreg	14			1.02														0.29			
Pueblo, Colo	26			0.22														*			
Raleigh, N. C	2-3			0.84														0.12			
Richmond, Va	5			1.17														0.30			
Rochester, N. Y	27			1.15														*			
Sacramento, Cal	9			0.24														0.20			
St. Louis, Mo	9-10			0.42														*			
St. Paul, Minn	26-27			0.56														0.12			
Salt Lake City, Utah	25			0.33														*			
San Antonio, Tex	4			0.52														0.20			
San Diego, Cal	31			0.81														0.41			

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TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Sandusky, Ohio	26-27			1.56														*			
San Francisco, Cal	23			0.41														0.16			
Savannah, Ga	27-28			0.29														0.13			
Scranton, Pa	26-27			1.09														0.10			
Seattle, Wash	29			1.37														0.21			
Shreveport, La	23-24	6:30 p. m.	6:45 a. m.	2.18	8:57 p. m.	10:02 p. m.	0.14	0.13	0.22	0.38	0.59	0.79	0.97	1.11	1.21	1.30	1.36	1.51	1.63		
Do	25-26	8:02 p. m.	10:20 p. m.	7.21	11:07 a. m.	12:25 p. m.	3.41	0.06	0.15	0.39	0.50	0.56	0.66	0.78	0.87	0.96	1.05	1.16	1.39		
Spokane, Wash	28-29			0.94														*			
Springfield, Ill	26-27			0.26														*			
Springfield, Mo	26-27			0.66														*			
Syracuse, N. Y	27			1.87														*			
Tampa, Fla	14			0.64														0.27			
Taylor, Tex	23			0.26														*			
Toledo, Ohio	26-27			1.32														*			
Topeka, Kans	26-27			0.25														*			
Valentine, Nebr	23-24			0.06														*			
Vicksburg, Miss	26-27			2.67														*			
Washington, D. C	24			0.69														0.19			
Wichita, Kans	4-5			0.10														*			
Williston, N. Dak	15-16			0.22														*			
Wilmington, N. C	5			0.68														0.18			
Wytheville, Va	5			1.17														0.19			
Yankton, S. Dak	26-27			0.24														*			
Havana, Cuba	15			0.56														0.39			
San Juan, Porto Rico	15-16			0.40														0.22			

*Self-register not working † No precipitation during month.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, December, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure. Sea level, reduced to mean of 24 hours.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.47	29.61	—.22	23.6	— 5.1	29.3	18.0	7.00	+1.97	22.4
Sydney, C. B. I	29.78	29.82	—.07	22.3	— 5.9	28.6	16.1	5.59	+0.96	35.5
Halifax, N. S	29.80	29.91	—.05	20.2	— 7.4	28.1	12.3	4.60	—0.52	27.3
Grand Manan, N. B	29.86	29.92	—.06	20.3	— 8.0	28.2	12.4	2.63	—1.79	14.1
Yarmouth, N. S	29.86	29.94	—.04	24.1	— 6.6	30.0	18.3	3.04	—2.00	19.1
Charlottetown, P. E. I	29.83	29.87	—.07	16.0	— 8.3	23.0	9.1	1.90	—1.76	15.8
Chatham, N. B	29.86	29.89	—.05	10.4	— 6.6	20.6	0.2	1.38	—1.84	13.2
Father Point, Que	29.90	29.93	—.02	10.0	— 5.4	16.3	3.8	2.19	—0.64	21.9
Quebec, Que	29.65	29.99	—.02	6.3	— 8.9	13.0	— 0.3	2.39	—1.30	23.9
Montreal, Que	29.80	30.03	.00	9.2	— 9.1	15.6	2.9	3.54	—0.11	30.6
Rockliffe	29.39	29.97	—.04	2.3	—12.7	14.4	— 9.7	1.04	—1.45	10.4
Ottawa, Ont	29.66	30.00	—.02	8.9	— 8.1	16.1	1.8	1.89	—1.02	18.9
Kingston, Ont	29.69	30.03	—.01	15.0	— 8.7	23.1	6.9	1.85	—1.39	14.3
Toronto, Ont	29.61	30.01	—.04	22.3	— 4.7	29.4	15.1	1.41	—1.50	7.2
White River, Ont	28.63	30.08	+.06	1.8	— 7.9	14.5	—11.0	2.12	+0.41	21.2
Port Stanley, Ont	29.35	30.02	—.05	23.6	— 4.8	30.2	17.1	2.72	+0.30	15.5
Saugeen, Ont	29.24	29.97	—.05	22.0	— 4.7	30.3	13.7	3.78	—0.20	23.7
Parry Sound, Ont	29.23	30.02	+.01	12.8	— 8.4	22.9	2.7	3.85	—0.63	28.5
Port Arthur, Ont	29.30	30.04	+.05	10.1	— 3.1	19.6	0.7	1.43	+0.56	14.3
Winnipeg, Man	29.19	30.08	+.06	6.2	+ 2.1	16.5	— 4.2	1.65	+0.74	16.5
Minnedosa, Man	28.14	30.05	+.03	8.7	+ 3.0	18.6	— 1.2	0.76	+0.14	7.6
Qu'Appelle, Assin	27.65	30.01	+.01	10.7	+ 3.3	19.3	2.0	0.85	+0.33	8.5
Medicine Hat, Assin	27.62	29.97	.00	22.4	+ 4.2	32.4	12.4	0.50	—0.05	3.0
Swift Current, Assin	27.34	30.02	+.03	17.8	+ 1.8	26.5	9.1	0.31	—0.47	3.1
Calgary, Alberta	26.30	29.97	+.03	20.2	+ 2.0	29.1	11.5	0.31	—0.28	3.1
Banff, Alberta	25.27	30.05	+.11	19.8	+ 0.7	27.5	12.1	1.28	+0.07	12.8
Edmonton, Alberta	27.54	29.91	—.02	16.6	+ 3.5	25.5	7.7	1.09	+0.39	10.8
Prince Albert, Sask	28.32	29.96	—.05	5.4	+ 2.6	14.6	— 3.8	0.52	—0.22	5.2
Battleford, Sask	28.19	30.02	—.03	11.2	+ 5.8	20.1	2.3	0.25	—0.07	2.5
Kamloops, B. C	28.74	29.98	+.04	31.5	+ 2.6	36.6	26.4	0.82	+0.04	4.0
Victoria, B. C	29.89	29.99	+.02	43.8	+ 2.6	47.2	40.5	4.71	—3.27	0.0
Barkerville, B. C	25.51	29.89	+.01	22.9	+ 2.0	29.0	16.8	3.56	+0.39	35.0
Hamilton, Bermuda	29.95	30.12	.00	64.7	0.0	69.5	59.9	2.12	—2.37	

TABLE VII.—*Heights of rivers referred to zeros of gages, December, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Milk River.								
Havre, Mont. (31)	237	9						
James River.								
Huron, S. Dak. (31)	139	9						
Republican River.								
Clay Center, Kans	42	18	6.8	23	5.6	28	6.4	1.2
Smoky Hill River.								
Abilene, Kans	45	22	3.0	27	1.6	17-26	1.9	1.4
Kansas River.								
Manhattan, Kans	160	18	3.5	31	2.5	14-21	2.9	1.0
Topeka, Kans. (6)	87	21	7.2	23	6.1	12-14	6.5	1.1
Missouri River.								
Bismarck, N. Dak	1,309	14	4.1	29, 30	— 0.5	1	1.8	4.6
Pierre, S. Dak. (10)	1,114	14	1.3	1	— 1.3	9	—0.3	2.6
Sioux City, Iowa	784	19	4.8	1	2.5	13	3.7	2.3
Blair, Nebr	705	15	4.3	1	2.0	12	3.4	2.3
St. Joseph, Mo	481	10	0.2	1-3	— 4.5	29	—1.6	4.7
Kansas City, Mo	388	21	6.3	3, 4	2.1	29-31	4.5	4.2
Glasgow, Mo. (4)	231	18	1.9	6	— 1.0	15, 16	0.5	2.9
Boonville, Mo	199	20	5.2	1, 2	2.1	31	4.3	3.1
Hermann, Mo	103	24	4.7	1, 2	2.0	31	3.7	2.7
Minnesota River.								
Mankato, Minn	127	18	2.2	28-31	1.8	21-27	2.0	0.4
St. Croix River.								
Stillwater, Minn. (31)	23	11						
Red Cedar River.								
Cedar Rapids, Iowa (3)	77	14	4.3	29	2.6	1, 3-9, 11, 12, 16	2.8	1.7
Iowa River.								
Iowa City, Iowa (14)	57		— 1.3	12	— 1.8	2, 4, 24	—1.6	0.5
Illinois River.								
Peoria, Ill	135	14	8.7	29-31	7.6	4, 5	7.9	1.1
Red Bank Creek.								
Brookville, Pa	35	8	1.7	28	— 0.4	1-23	—0.1	2.1
Clarion River.								
Clarion, Pa. (12)	32	10	6.9	28	— 0.4	2, 3, 7-11	0.8	7.3
Conemaugh River.								
Johnstown, Pa. (13)	64	7	3.9	28	0.4	2-10	0.8	3.5
Allegheny River.								
Warren, Pa. (14)	177	14	7.8	29	0.0	9, 10	1.9	7.8
Oil City, Pa	123	13	8.2	29	0.4	1	2.6	7.8
Parker, Pa	73	20	7.4	28	0.2	1	1.9	7.2
Freeport, Pa. (9)	29	20	14.0	29	1.0	1, 2	4.1	13.0
Cheat River.								
Rowlesburg, W. Va. (18)	36	14	5.6	25	0.6	1-4	2.4	5.0
Youghiogheny River.								
Confluence, Pa. (11)	59	10	3.6	28	— 0.8	5-7	0.3	4.4
West Newton, Pa. (13)	15	23	4.5	28	0.0	1-11	1.2	4.5
Monongahela River.								
Weston, W. Va. (12)	161	18	1.0	25	— 2.4	1-12	—1.5	3.4
Fairmont, W. Va	119	25	17.8	26	10.7	1	12.2	7.1
Greensboro, Pa. (1)	81	18	12.8	26	5.4	1-8, 12-22	6.5	7.4
Lock No. 4, Pa	40	28	12.9	28	6.7	8	7,8	6.2
Beaver River.								
Ellwood Junction, Pa. (18)	10	14	2.5	28	1.1	1-10	1.4	1.4

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Muskingum River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Zanesville, Ohio	70	25	12.9	28	7.3	16, 23	8.1	5.6
Little Kanawha River.								
Glenville, W. Va	77	20	3.0	25	− 0.4	7, 8	0.5	3.4
Creston, W. Va	38	20	4.2	29	− 0.8	1-19	0.1	5.0
Great Kanawha River.								
Charleston, W. Va	58	30	8.0	29	7.0	15-25, 27, 31	7.2	1.0
New River.								
Radford, Va	155	14	0.0	11, 12	− 1.8	1, 19-22	−0.9	1.8
Hinton, W. Va	95	14	2.1	29	0.8	22, 23	1.3	1.3
Scioto River.								
Columbus, Ohio (10)	110	17	4.0	28	1.0	2-13	1.7	3.0
Licking River.								
Falmouth, Ky. (12)	30	25	1.8	28	0.2	1-9	0.6	1.6
Miami River.								
Dayton, Ohio (15)	77	18	2.8	28	0.5	1-8	1.0	2.3
Kentucky River.								
Jackson, Ky	287	24	5.9	29	2.4	1-5	4.2	3.5
Beattyville, Ky	254	30	2.3	29	− 0.3	1-4	0.7	2.6
High Bridge, Ky	117	17	10.5	31	8.0	3-10	8.7	2.5
Frankfort, Ky	65	31	7.0	27, 31	4.1	1-4, 14-18	4.8	2.9
Wabash River.								
Terre Haute, Ind	171	16	0.6	27	− 1.2	19-23	−0.7	1.8
Mount Carmel, Ill. (4)	75	15	5.6	31	0.6	6-17	1.0	5.0
Cumberland River.								
Burnside, Ky	518	50	10.1	29	1.1	22-24	3.3	9.0
Celina, Tenn	383	45	13.4	30	0.8	1, 2	3.6	12.6
Carthage, Tenn	308	40	15.8	29	0.2	1-4	3.5	15.6
Nashville, Tenn	193	40	18.8	31	6.8	1	9.3	12.0
Clarksville, Tenn. (a)	126	42	22.6	28	0.3	7	6.2	22.3
Powell River.								
Tazewell, Tenn	44	20	6.0	29	0.4	3, 4, 13, 23	1.6	5.6
Clinch River.								
Speers Ferry, Va	156	20	3.1	6	− 0.5	2, 23	0.4	3.6
Clinton, Tenn	52	25	11.5	28, 30	3.3	23	6.0	8.2
Holston River.								
Bluff City, Tenn	170	15	2.0	28	0.3	1, 2, 23, 24	0.8	1.7
Rogersville, Tenn	103	14	3.4	7	1.3	1, 2	1.9	2.1
French Broad River.								
Asheville, N. C	144	6	0.7	28, 29	− 1.9	1, 2	−1.3	2.6
Leadvale, Tenn	70	15	1.0	7, 28, 29	− 1.4	9, 23	−0.7	2.4
Little Tennessee River.								
McGhee, Tenn	17	20	5.2	28	1.1	21-23	2.0	4.1
Hiwassee River.								
Charleston, Tenn	18	22	5.5	28	0.2	16, 19, 20, 22, 23	1.3	5.3
Tennessee River.								
Knoxville, Tenn	635	29	3.6	30	0.2	23, 24	0.9	3.4
Loudon, Tenn	590	25	3.9	29	0.5	1, 2	1.5	3.4
Kingston, Tenn	556	25	7.1	28	0.9	1	2.4	6.2
Chattanooga, Tenn	452	33	10.2	29	1.1	1	3.5	9.1
Bridgeport, Ala	402	24	8.7	30	0.4	1	2.1	8.3
Guntersville, Ala	349	31	13.2	30	1.0	1, 2	4.0	12.2
Florence, Ala	255	16	8.5	31	− 0.1	1	1.9	8.6
Riverton, Ala	225	26	12.6	30	0.9	1	3.9	11.7
Johnsonville, Tenn	95	21	12.1	30	− 0.1	1	3.3	12.0
Ohio River.								
Pittsburg, Pa	966	22	12.3	29	4.3	15, 16	6.0	8.0
Davis Island Dam, Pa. (b)	960	25	12.3	29	1.5	12	3.4	10.8
Beaver Dam, Pa	925	27	17.2	29	2.1	9, 10	4.7	15.1
Wheeling, W. Va	875	36	16.4	30	1.4	11, 18, 21	3.8	15.0
Parkersburg, W. Va	785	36	15.0	30, 31	1.6	1-4	3.6	13.4
Point Pleasant, W. Va	703	39	15.8	31	0.8	3, 4, 23	2.5	15.0
Huntington, W. Va	660	50	18.6	31	3.0	3, 23, 25	4.9	15.6
Catlettsburg, Ky	651	50	18.2	31	1.1	2-7	3.2	17.1
Portsmouth, Ohio	612	50	17.5	31	2.2	4-8	3.8	15.3
Maysville, W. Va	559	50	15.5	30	2.2	24-26	3.5	13.3
Cincinnati, Ohio	499	50	11.8	31	3.4	10	4.6	8.4
Madison, Ind	413	46	5.9	29	2.9	10, 11	3.9	3.0
Louisville, Ky	367	28	3.4	29, 30	2.2	7-12	2.6	1.2
Evansville, Ind	184	35	5.0	31	1.2	3, 4, 12-16	1.8	3.8
Mount Vernon, Ind	148	35	4.0	31	0.5	14-23	1.0	3.5
Paducah, Ky	47	40	10.4	31	0.4	1-3	2.5	10.0
Cairo, Ill	1	45	13.0	31	3.1	25	5.7	9.9
St. Francis River.								
Marked Tree, Ark	104	17	3.1	28-31	1.2	1-4, 13-24	1.6	1.9
Neosho River.								
Neosho Rapids, Kans	326	22	0.3	1, 5, 12-16	0.2	2-4, 6-11, 17-31	0.2	0.1
Iola, Kans	262	10	0.4	9-25	0.3	1-8, 27-31	0.4	0.1
Oswego, Kans	184	20	0.4	12	0.2	1, 2, 29, 30	0.3	0.2
Fort Gibson, Ind. T	3	22	9.0	1-10, 17-31	8.9	11-16	9.0	0.1
Canadian River.								
Calvin, Ind. T	99	10	1.6	15	0.0	1-4	0.5	1.6
Black River.								
Blackrock, Ark	67	12	1.6	24, 25	1.4	1-23, 29-31	1.4	0.2
White River.								
Calicorock, Ark	272	15	0.7	1-31	0.7	1-31	0.7	0.0
Batesville, Ark	217	18	2.4	26	2.2	1-9	2.3	0.2
Newport, Ark	185	26	0.6	26-28	0.2	1-7, 16-23	0.3	0.4
Clarendon, Ark. (a)	75	30	7.3	28, 29	5.4	19, 21	6.0	1.9
Arkansas River.								
Wichita, Kans	832	10	0.4	24	− 0.4	31	0.1	0.8
Tulsa, Ind. T	551	16	1.9	1, 11	1.7	7, 22, 27	1.8	0.2
Webbers Falls, Ind. T	465	23	3.0	30	2.6	31	2.8	0.4
Fort Smith, Ark	403	22	2.4	28-30	2.1	9-18, 21-27	2.2	0.3
Dardanelle, Ark	256	21	2.0	1-31	2.0	1-30	2.0	0.0
Little Rock, Ark	176	23	3.9	27	3.4	10-23	3.5	0.5
Yazoo River.								
Greenwood, Miss	175	38	18.0	31	0.4	1, 2	2.9	17.6
Yazoo City, Miss	80	25	9.0	31	− 2.5	1	−0.8	11.5
Ouachita River.								
Camden, Ark	304	39	22.5	30	4.0	2-4, 21-23	6.6	18.5
Monroe, La	122	40	23.3	31	1.0	4	4.9	22.3
Red River.								
Arthur City, Tex	688	27	4.3	1-31	4.3	1-31	4.3	0.0
Red River—Cont'd.								
Fulton, Ark	515	28	5.5	27, 28	4.4	22, 23	4.7	1.1
Springbank	441	29	6.2	31	2.8	20	3.4	3.4
Shreveport, La	327	29	3.0	28	− 1.8	22, 23	−0.9	4.8
Alexandria, La	118	33	8.6	31	− 1.8	24	0.4	10.4
Mississippi River.								
St. Cloud, Minn. (31)	2,034	4	......	......	......	......	......	......
St. Paul, Minn. (19)	1,954	14	3.7	12	2.6	5, 6	3.1	1.1
Red Wing, Minn. (31)	1,914	14	......	......	......	......	......	......
Reeds Landing, Minn	1,884	12	2.2	1	0.3	30, 31	0.9	1.9
La Crosse, Wis. (17)	1,819	12	3.5	1-3	3.2	13, 14	3.3	0.3
Prairie du Chien, Wis. (27)	1,759	18	4.0	4	3.2	3	3.9	0.8
Dubuque, Iowa	1,699	18	5.0	28	2.4	9	3.7	2.6
Clinton, Iowa	1,629	16	4.3	29	1.6	15	3.1	2.7
Leclaire, Iowa (18)	1,609	10	2.1	1	0.4	13	1.3	1.7
Davenport, Iowa (1)	1,593	15	9.2	31	0.8	16, 18	2.6	8.4
Muscatine, Iowa	1,562	16	5.3	27	2.4	15	4.1	2.9
Galland, Iowa (1)	1,472	8	2.0	1	0.6	17, 18, 25, 26	1.1	1.4
Keokuk, Iowa (1)	1,463	15	5.9	30	− 0.6	18, 19	1.2	6.5
Warsaw, Ill. (2)	1,458	18	6.8	31	2.3	19	4.4	4.5
Hannibal, Mo. (17)	1,402	13	3.9	1	0.2	21	3.0	3.7
Grafton, Ill	1,306	23	6.2	1	2.3	22, 31	4.1	3.9
St. Louis, Mo	1,264	30	5.0	1	0.0	31	2.3	5.0
Chester, Ill	1,189	30	5.1	1	1.1	31	2.9	4.0
Cape Girardeau, Mo	1,128	28	9.1	1, 2	5.0	31	6.9	4.1
New Madrid, Mo	1,003	34	9.1	31	2.3	26	4.2	6.8
Luxora, Ark	905	33	1.6	31	− 2.0	24	−0.7	3.6
Memphis, Tenn	843	33	3.3	31	0.6	26	1.9	2.7
Helena, Ark	767	42	4.5	31	2.3	26	3.6	2.2
Arkansas City, Ark	635	42	5.5	31	2.5	26	3.8	3.0
Greenville, Miss	595	42	4.3	31	1.9	26	3.0	2.4
Vicksburg, Miss	474	45	2.3	1	0.2	26	1.1	2.1
Natchez, Miss	373	46	6.1	1	4.3	16-19	4.8	1.8
Baton Rouge, La	240	35	3.4	27	1.6	18	2.6	1.8
Donaldsonville, La	188	28	3.3	27	1.2	21	1.9	2.1
New Orleans, La	108	16	4.3	27	2.1	20	3.6	2.2
Atchafalaya River.								
Simmesport, La	127	......	6.6	31	− 1.2	19, 20	3.0	7.8
Melville, La	103	31	10.7	31	3.2	20, 21	4.6	7.5
Penobscot River.								
Mattawamkeag, Me	87	......	13.1	3	10.5	1	11.9	2.6
Montague, Me. (19)	60	......	1.3	11	3.1	2	3.6	1.2
Kennebec River.								
Winslow, Me	46	......	4.2	18	3.3	17	3.8	0.9
Merrimac River.								
Franklin Junction, N. H. (14)	110	......	4.9	12	3.6	4	4.2	1.3
Concord, N. H. (31)	94	......	......	......	......	......	......	......
Manchester, N. H	68	......	3.1	4, 26	1.0	21	2.0	2.1
Connecticut River.								
Wells River, Vt. (31)	255	......	......	......	......	......	......	......
Whiteriver Junction, Vt (29)	209	......	......	......	......	......	......	......
Bellows Falls, Vt	170	12	2.8	4	0.0	22, 23	1.4	2.8
Holyoke, Mass	84	9	3.0	26	− 0.2	17	1.6	3.2
Hartford, Conn. (21)	50	13	3.5	6	1.9	2	2.7	1.6
Housatonic River.								
Gaylordsville, Conn	44	15	4.7	28	3.8	11	4.1	0.9
Mohawk River.								
Tribeshill, N. Y	42	15	5.0	28	0.7	12-21	1.3	4.3
Schenectady, N. Y	19	15	9.0	29	0.9	13-27	1.5	8.1
Hudson River.								
Glens Falls, N. Y	197	......	6.7	11, 27	4.5	23	5.5	2.2
Troy, N. Y	154	14	10.3	29	2.0	3, 5, 20	3.2	8.3
Albany, N. Y	147	12	6.9	29	− 0.1	3	2.5	7.0
Stuyvesant, N. Y	128	9	4.0	28	− 0.5	5	1.6	4.5
Pompton River.								
Pompton Plains, N. J. (3)	6	8	4.7	28	4.4	1-24	4.4	0.3
Passaic River.								
Chatham, N. J. (17)	69	7	4.0	29	2.3	4, 5	2.7	1.7
Lehigh River.								
Mauchchunk, Pa. (17)	45	15	5.6	29	4.3	5, 10, 11	4.2	1.3
Schuylkill River.								
Reading, Pa	66	12	0.7	28	− 0.1	21-23	0.1	0.8
Delaware River.								
Hancock (E. Branch), N. Y	269	12	6.6	28	3.7	10	4.6	2.9
Hancock (W. Branch), N. Y	269	10	7.1	28	3.1	5, 6, 8	4.3	4.0
Port Jervis, N. Y	204	14	5.5	29	0.5	10-12	1.2	5.0
Phillipsburg, N. J. (25)	142	26	8.7	29	1.8	4, 5	2.2	6.9
Trenton, N. J	92	18	10.7	31	1.2	11	2.8	9.5
North Branch Susquehanna.								
Binghamton, N. Y	183	16	10.0	29	2.5	13, 18, 20, 23, 24	3.4	7.5
Towanda, Pa. (15)	139	16	8.8	29	1.1	7	2.9	7.7
Wilkesbarre, Pa	60	17	13.7	30	3.1	11	4.5	10.6
West Branch Susquehanna.								
Clearfield, Pa	165	8	3.5	28	0.4	4-23	0.8	3.1
Lockhaven, Pa. (27)	65	12	......	......	......	......	......	......
Williamsport, Pa	39	20	5.5	30	0.2	18-23	0.8	5.3
Juniata River.								
Huntingdon, Pa. (28)	90	24	......	......	......	......	......	......
Susquehanna River.								
Selingsgrove, Pa. (18)	116	17	8.0	30	0.5	7-10, 15-23	1.0	7.5
Harrisburg, Pa	69	17	9.4	30	1.3	17	2.3	8.1
Shenandoah River.								
Riverton, Va	58	22	0.5	1-31	0.5	1-31	0.5	0.0
Potomac River.								
Cumberland, Md	290	8	2.8	31	1.0	1-10	1.5	1.8
Harpers Ferry, W. Va	172	18	2.0	30	− 2.8	15, 16	−2.1	4.8
James River.								
Buchanan, Va	305	12	2.4	29	1.7	14-17	1.9	0.7
Lynchburg, Va	260	18	0.9	28, 29	0.1	1-4	0.4	0.8
Columbia, Va	167	18	3.6	28	2.1	1, 2	2.6	1.5
Richmond, Va	111	12	0.9	8, 27	− 1.2	1, 2, 17, 18	−0.4	2.1
Dan River.								
Danville, Va	55	8	0.6	7	− 0.4	1-4	0.1	1.0

TABLE VII.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
	Miles.	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Roanoke River.								
Weldon, N. C.	129	30	16.9	7	8.4	1	10.0	8.5
Cape Fear River.								
Fayetteville, N. C.	112	38	17.0	7	5.0	1,2	9.2	12.0
Waccamaw River.								
Conway, S. C.	40	7	2.8	15	1.0	22	2.0	1.8
Pedee River.								
Cheraw, S. C.	149	27	11.8	7	1.9	2	3.7	9.9
Smiths Mills, S. C.	51	16	9.8	12, 13	3.3	3	6.1	6.5
Lynch Creek.								
Effingham, S. C.	35	12	6.0	28, 29	3.7	1	5.0	2.3
Black River.								
Kingstree, S. C.	45	12	4.0	14-19, 31	3.4	3	3.7	0.6
Catawba River.								
Mount Holly, N. C	28	15	2.2	7	1.5	1,2	1.4	0.7
Wateree River.								
Camden, S. C.	37	24	14.1	7	3.7	1	6.0	10.4
Congaree River.								
Columbia, S. C	52	15	3.8	8	− 0.7	1,2	0.8	4.5
Santee River.								
St. Stephens, S. C.	50	12	7.4	12	− 0.4	3	3.0	7.8
Edisto River.								
Edisto, S. C.	75	6	3.2	31	1.8	1–3	2.7	1.4
Broad River.								
Carlton, Ga.	30	11	4.2	6	1.9	1, 20–24	2.3	2.3
Savannah River.								
Calhoun Falls, S. C.	347	15	4.0	29	2.2	1	2.9	1.8
Augusta, Ga.	268	32	11.0	7	5.4	2	7.4	5.6
Oconee River.								
Milledgeville, Ga.	147	25	5.4	28	1.3	1	2.5	4.1
Dublin, Ga	79	30	3.0	9	− 0.5	19, 20	1.0	3.5
Oemulgee River.								
Macon, Ga.	203	18	6.4	28	1.0	1	2.6	5.4
Abbeville, Ga.	96	11	5.3	10	1.2	2	2.8	4.1
Flint River.								
Woodbury, Ga.	227	10	1.5	29	0.1	1	0.5	1.4
Montezuma, Ga.	152	20	6.3	30	2.0	1	3.7	4.3
Albany, Ga.	90	20	4.1	31	0.5	1	2.0	3.6
Bainbridge, Ga	29	22	4.8	9, 10	2.3	1–3	3.4	2.5
Chattahoochee River.								
West Point, Ga	239	20	3.7	30	1.7	1, 21–24	2.3	2.0
Eufaula, Ala	90	40	6.0	28–30	0.4	1	2.4	5.6
Alaga, Ala	30	25	7.5	30	1.2	2	3.2	6.3
Coosa River.								
Rome, Ga.	271	30	5.0	7, 29	0.0	1, 25	1.7	5.0
Gadsden, Ala.	144	22	6.4	30	− 0.8	1	1.2	7.2
Lock No. 4, Ala.	116	17	5.4	31	− 0.3	1,2	1.3	5.7
Wetumpka, Ala	6	45	9.0	31	0.8	1,2	3.2	8.2
Tallapoosa River.								
Milstead, Ala.	38	35	6.9	30	1.2	1,2	2.3	5.7
Alabama River.								
Montgomery, Ala.	265	35	5.6	31	− 0.9	1,2	1.0	6.5
Selma, Ala	212	35	6.7	31	− 1.6	25–27	1.2	8.3
Black Warrior River.								
Tuscaloosa, Ala.	90	43	26.5	29	4.1	1	8.5	22.4
Tombigbee River.								
Columbus, Miss	303	33	2.5	31	− 1.9	23, 24	−1.6	4.4
Vienna, Ala. (d)	233	42	6.5	31	0.0	1	2.1	6.5
Demopolis, Ala.	155	35	17.3	31	− 2.6	3	2.4	19.9
Leaf River.								
Hattiesburg, Miss	60	20	5.0	5	2.3	1	2.9	2.7
Chickasawhay River.								
Enterprise, Miss	144	18	5.1	27–29	0.0	1–4	2.2	5.1
Shubuta, Miss.	106	25	10.0	29–31	3.1	23–26	4.7	6.9
Pascagoula River.								
Merrill, Miss. (c)	78	20	5.4	31	0.7	23–26	1.7	4.7
Pearl River.								
Jackson, Miss	242	20	2.4	31	0.8	3	1.3	1.6
Columbia, Miss.	110	14	2.0	30	0.0	1, 12, 15–21, 23, 24, 26	4.6	2.0
Sabine River.								
Logansport, La.	315	25	26.8	29	0.6	18–23	4.7	26.2
Neches River.								
Rockland, Tex	105	20	13.0	28	− 0.3	1-3, 19–23	1.3	13.3
Beaumont, Tex.	18	10	1.7	23	− 0.9	28	0.2	2.6
Trinity River.								
Dallas, Tex.	320	25	2.5	6	2.2	4, 5, 12–15, 21, 28–31	2.3	0.3
Riverside, Tex.	112	40	12.4	29	− 0.3	14–22	1.6	12.7
Liberty, Tex	20	25	17.0	30	2.8	15, 17, 18	5.1	14.2
Brazos River.								
Kopperl, Tex	345	21	0.0	1, 2	− 0.8	23–31	−0.5	0.8
Waco, Tex.	285	24	2.8	1–12	2.5	30, 31	2.7	0.3
Hempstead, Tex	140	40	6.8	29	− 2.5	23–25	−0.8	9.3
Booth, Tex	61	39	6.4	30	2.2	3, 10	4.2	4.2
Colorado River.								
Ballinger, Tex.	489	21	1.6	5–7	1.4	29–31	1.5	0.2
Austin, Tex.	214	18	1.5	8–10	1.2	18-21, 27-31	1.3	0.3
Columbus, Tex.	98	24	19.5	26	5.9	6–9	7.0	13.6
Guadalupe River.								
Gonzales, Tex	112	22	1.7	26	0.5	29, 30	0.7	1.2
Victoria, Tex	35	16	17.2	27	1.4	19	3.2	15.8
Red River of the North.								
Moorhead, Minn. (a)	284	26	.....	.....	.....	.....	.....	.....
Kootenai River.								
Bonners Ferry, Idaho (b)	123	24	− 0.1	1	− 1.6	24	0.9	0.5
Pend d'Oreille River.								
Newport, Wash.	86	14	− 1.1	4–10	− 1.4	14, 15, 22, 25–29	−1.3	0.3
Snake River.								
Lewiston, Idaho	144	24	2.1	2, 3	1.2	30	1.8	0.9
Columbia River.								
Wenatchee, Wash	473	40	5.2	7	4.3	30, 31	4.8	0.9
Umatilla, Oreg.	270	25	0.8	1	− 0.7	30, 31	−0.1	1.5
The Dalles, Oreg.	166	40	2.0	2, 15	0.4	12	1.1	1.6
Willamette River.								
Eugene, Oreg.	183	10	14.0	30	3.0	1–3	5.7	11.0
Albany, Oreg.	118	20	16.8	31	1.8	9	5.4	15.0
Salem, Oreg	84	20	15.7	31	1.5	9	5.6	14.2
Portland, Oreg.	12	15	10.4	31	2.2	4	4.8	8.2
Sacramento River.								
Red Bluff, Cal.	201	23	21.3	30	3.4	4–6	5.8	17.9
Sacramento, Cal.	64	25	17.0	31	10.6	25	11.7	6.4

Small figures indicate number of days river was frozen. (a) For 26 days only. (b) Wickets lowered on 25th. (c) For 16 days only. (d) For 28 days only.

HAWAIIAN CLIMATOLOGICAL DATA.

By ALEXANDER McC. ASHLEY, Section Director, United States Weather Bureau.

GENERAL SUMMARY FOR DECEMBER, 1904.

Following is the summary of meteorological conditions in the Hawaiian Islands during December, 1904:

Approximate percentages of district rainfall as compared with normals: Hawaii, Hilo, 47; Hamakua, 44; Kohala, 86; Kau, 74. Maui (East), 131. Oahu, Honolulu, 82; Nuuanu, 99; Koolau, 126; Ewa, 70. Kauai, Lihue, 109; Kilauea, 100.

The greatest monthly rainfall reported was 17.58 inches at Nahiku, Maui. The greatest 24-hour rainfall was 5.35 inches, on the 3d, at Maunawili ranch, Oahu.

Hawaii—Pahala reports gale on 20th and 21st; Niulii reports a particularly calm month; Pepeekeo reports a fall of snow covering the hills on the 20th.

Oahu—Thunderstorms occurred on the 2d, 19th and 21st accompanied by lightning.

Correction note: The greatest 24-hour rainfall for November was 4.50 inches on the 9th at Puuohua, Hawaii.

Temperature table for December, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Olaa Mill	210	83.0	62.0	73.0	90	58
Kau	1,850	77.0	57.0	67.0	85	52
Ookala	400	80.0	65.0	72.0	84	60
Pepeekeo	100	79.0	67.0	73.0	83	64
Niulii	200	78.0	68.0	73.0	83	65
Pahala	850	79.0	64.0	71.0	83	57
Hakalau	200	78.0	65.0	72.0	80	62
Paauhau	300	79.0	70.0	74.0	84	66
Kohala Mission	270	80.0	65.0	73.0	83	60
United States Weather Bureau	121	77.0	68.0	72.0	80	64
United States Magnetic Station	45	79.0	65.0	72.0	83	58
United States Experiment Station	350	79.0	67.0	73.0	82	62
Ahuimanu	350	77.0	66.0	72.0	86	61
Kahuku	25	78.0	68.0	73.0	82	62
Waiawa	675	77.0	64.0	71.0	82	59
Punahou	47	77.0	68.0	72.0	80	62
Ewa Mill	60	78.0	64.0	71.0	82	58
Kalihi-uka	485	79.0	64.0	72.0	86	59
Koloa	241	79.0	64.0	72.0	83	57
Kealia	15	77.0	65.0	71.0	81	56
Lihue	200	79.0	63.0	71.0	84	54
Makaweli	140	81.0	65.0	73.0	85	57
Kilauea	342	76.0	63.0	70.0	82	56
Waiakoa	2,700	73.0	58.0	66.0	80	51
Kailua	285	78.0	63.0	70.0	85	58
Keanae	1,000	85.0	65.0	75.0	99	60
Hanomanu	1,800	70.0	60.0	65.0	79	56
Nahiku	1,600	73.0	62.0	68.0	81	57
Kihei	55	81.0	68.0	74.0	85	63
Wailuku	250	82.0	65.0	73.0	85	55
Kaanapali	12	80.0	65.0	72.0	83	60
Keomuku	10	72.0	59.0	65.0	84	53
Kaahoolawe	10	80.0	70.0	75.0	84	60

Honolulu, Hawaii, latitude, 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —.057 applied. December, 1904.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	30.01	29.92	74.5	75.3	78	70	72.0	89	71.3	82	se.	5	s.	15	0.05	0.00	10	S.-cu.	s.	5	S.-cu.	s.
2	29.90	29.80	75.0	75.2	78	72	72.1	87	73.2	91	s.	18	se.	19	0.03	0.03	10	S.-cu.	s.	10	N.	s.
3	29.77	29.87	73.1	71.3	78	68	71.9	94	68.3	86	se.	20	nw.	4	0.45	0.01	10	N.	s.	3	S.-cu.	calm.
4	29.91	29.92	72.5	75.0	76	68	67.8	78	71.0	82	nw.	6	w.	10	0.00	0.00	2 1	Ci.-cu. S.-cu.	w. calm.	10	A.-s.	calm.
5	29.96	30.01	74.5	71.2	80	70	68.2	72	67.3	82	w.	13	ne.	8	0.01	T.	few.	Cu.	w.	10	S.-cu.	calm.
6	30.02	30.00	73.4	72.5	79	68	68.4	78	69.0	84	sw.	3	n.	2	0.00	0.01	8	S.-cu.	calm.	2	S.-cu.	calm
7	30.00	30.00	73.4	71.5	78	67	69.2	81	67.0	79	e.	2	ne.	3	0.03	0.03	4	S.-cu.	se.	1	S.-cu.	calm.
8	30.00	30.01	74.0	69.0	76	67	68.3	75	63.0	72	ne.	2	ne.	5	0.00	0.00	1	S.-cu.	calm.	1	S.-cu.	calm.
9	30.08	30.09	74.0	73.0	78	66	68.2	75	67.0	73	ne.	4	ne.	3	0.00	0.00	few.	Cu.	calm.	few.	Cu.	calm.
10	30.17	30.12	76.1	74.2	79	72	68.3	67	68.2	74	ne.	7	e.	11	0.00	T.	4	S.-cu.	e.	7	S.-cu.	ne.
11	30.11	30.11	76.1	74.0	79	72	67.9	65	67.0	69	e.	9	ne.	4	T.	T.	1	S.-cu.	e.	6	S.-cu.	e.
12	30.10	30.05	74.0	71.2	79	69	68.7	77	67.2	81	e.	6	n.	4	0.00	T.	5	S.-cu.	e.	few.	S.-cu.	calm.
13	30.08	30.02	75.2	74.0	80	67	69.9	77	67.5	71	e.	1	ne.	15	0.00	T.	5	A.-cu.	calm.	6	Cu.	e.
14	30.08	30.08	70.4	72.1	75	67	68.3	90	66.1	73	n.	4	s.	4	0.09	0.39	10	S.-cu.	ne.	10	S.-cu.	e.
15	30.12	30.10	69.5	70.5	74	66	66.0	83	64.0	70	ne.	11	ne.	16	0.34	0.30	8	N.	ne.	10	N.	ne.
16	30.09	30.05	71.7	70.0	74	68	62.5	60	61.0	59	ne.	8	ne.	7	0.01	0.00	2	S.-cu.	e.	6	S.-cu.	ne.
17	30.05	30.00	71.0	71.0	74	67	60.3	53	62.2	61	ne.	12	ne.	3	0.00	T.	2	S.-cu.	ne.	9	S.-cu,	ne.
18	30.00	29.96	67.6	69.0	74	67	64.4	84	65.0	81	ne.	7	ne.	12	T.	0.01	10	N.	ne.	10	N.	ne.
19	29.94	29.91	67.0	70.0	74	64	65.4	92	66.0	81	n.	3	ne.	9	0.45	0.52	9	N.	n.	10	S.-cu.	ne.
20	29.91	29.87	74.8	73.5	76	70	67.0	67	68.0	76	ne.	5	ne.	19	0.19	0.01	5	S.-cu.	ne.	6	N.	ne.
21	29.86	29.83	74.0	73.5	77	71	66.7	68	68.0	76	n.	8	ne.	20	0.01	0.02	9 1	A.-cu. Cu.	sw. e.	3 6	Ci.-s S.-cu.	calm. ne.
22	29.84	29.75	75.0	74.0	79	72	68.8	73	68.1	74	ne.	4	ne.	5	T.	T.	5 5	A.-cu. S.-cu.	calm. e.	few.	S.-cu.	ne.
23	29.76	29.79	74.3	71.4	76	68	69.3	78	64.2	68	e.	1	n.	4	0.00	0.01	few.	S.-cu.	calm.	1	S.-cu.	calm.
24	29.86	29.91	74.5	72.0	76	69	70.3	81	68.5	84	sw.	13	nw.	2	0.01	0.11	9	S.-cu.	sw.	1	S.-cu.	calm.
25	29.97	29.96	74.5	70.0	77	66	69.5	78	66.0	81	n.	2	ne.	6	0.00	0.00	2 2	A.-cu. Cu.	w. calm.	1	S.-cu.	calm.
26	30.01	29.99	70.2	70.0	77	65	66.2	81	66.0	81	ne.	4	n.	5	0.00	T.	9	S.-cu.	se.	few.	S.-cu.	calm.
27	30.01	29.99	70.5	70.0	76	66	66.5	81	66.5	83	n.	4	nw.	4	0.00	0.00	1	Cu.	calm.	1	S.-cu.	calm.
28	30.06	30.07	71.4	71.0	76	66	66.0	75	66.2	78	ne.	4	n.	8	0.00	T.	few.	S.-cu.	calm.	9	S.-cu.	n.
29	30.15	30.17	72.2	70.0	75	68	63.7	63	61.5	61	ne.	13	ne.	14	0.01	0.00	6	S.-cu.	ne.	2	S.-cu.	ne.
30	30.19	30.14	70.5	70.0	75	67	61.0	58	63.0	68	e.	3	ne.	5	0.00	0.00	4	S.-cu.	e.	few.	S.-cu.	calm.
31	30.18	30.16	70.0	70.2	77	65	62.5	66	64.2	72	n.	4	ne.	4	0.00	0.00	7	S.-cu.	n.	2	S.-cu.	n.
Mean	30.007	29.989	72.7	71.8	76.8	68.0	67.3	75.7	66.5	75.9	ne.	6.6	ne.	8.1	1.68	1.45	5.4	S.-cu.	e.	4.8	S.-cu.	ne.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. * Pressure values are reduced to sea level and standard gravity.

Rainfall data for December, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Papaikou		4.71
Waiakea	50	4.50
Kaumana	1,050	4.36
Pepeekeo	100	4.32
Hakalau	200	5.43
Puuohua	1,050	7.23
Laupahoehoe	500	5.03
Ookala	400	2.84
Puueo	85	3.93
HAMAKUA, ne.		
Kukaiau	250	3.14
Paauilo	300	2.58
Paauhau	300	2.61
Honokaa (Meinicke)	465	2.88
Kukuihaele	700	2.72
KOHALA, n.		
Niulii	250	1.68
Kohala (Sugar Co.)	270	1.75
Hawi Mill	600	2.20
Puakea Ranch	600	1.93
Puuhue Ranch	1,847	3.30
Waimea	2,720	4.10
KONA, w.		
Huehue	2,000	1.12
Holualoa	1,350	1.10
Kealakekua	1,580	2.63
Kealakekua (Honalo)	1,500	1.89
Napoopoo	25	2.80
KAU, se.		
Kau	1.850	2.32
Honuapo	25	1.01
HAWAII—Cont'd.	*Feet.*	*Inches.*
Naalehu	650	1.38
Hilea	310	2.00
Pahala	850	1.19
Keaa Homesteads	2,000	1.89
PUNA, e.		
Olaa Mill	210	7.23
Olaa (9 mi.)		7.19
Olaa (13 mi.)		5.48
Olaa (17 mi.)	1,530	4.69
Olaa (20 mi.)	1,700	4.58
MAUI.		
Kaanapali	12	3.15
Waiopae Ranch	700	3.32
Kaupo (Mokulau), s	285	3.86
Kipahulu, s	308	4.25
Kailua	650	7.55
Keanae	1,000	13.82
Nahiku, ne	850	14.31
Hahiku	1,600	17.58
Honomanu	1,800	15.77
Haiku	700	5.89
Kula Waiakoa	2,700	0.86
Puuomalei, n	1,400	6.19
Paia	180	4.15
Haleakala Ranch	2,000	6.99
Wailuku, ne	250	6.14
Puunene	73	3.39
Kopiliula	1,300	14.20
Kahului	8	3.15
Makawao	1,700	9.07
Ukulele	5,300	3.99
MAUI—Cont'd.	*Feet.*	*Inches.*
Kihei	55	1.38
OAHU.		
U. S. Weather Bureau	108	3.13
Punahou (W. B.), sw	47	3.21
Kulaokahua (Castle), sw	50	2.69
U. S. Naval Station, sw	6	3.08
College Hills	175	5.76
Manoa (Woodlawn Dairy), c	285	8.90
Manoa (Rhodes Gardens)	300	10.38
Insane Asylum	30	3.86
Kalihi-uka	485	10.36
Nuuanu (W. W. Hall), sw	50	3.41
Nuuanu (Wyllie street)	250	3.17
Nuuanu (Elec. Station), sw	405	6.34
Nuuanu (Luakaha), c	850	13.27
U. S. Experiment Station	350	3.71
Tantalus Heights (Frear)	1,360	8.11
Waimanalo, ne	25	9.30
Maunawili, ne	250	14.38
Kaneohe	100	6.20
Ahuimanu, ne	350	15.62
Kahuku	25	4.85
Ewa Plantation, s.	60	1.95
U. S. Magnetic Station	45	2.23
Moanalua	15	3.57
Waiawa	675	5.91
KAUAI.		
Makawell	140	3.00
Olokele Valley	1,310	9.30
Kapahi	300	6.19
Kekaha	55	1.72
KAUAI—Cont'd.	*Feet.*	*Inches.*
Wilcox Ditch	725	4.60
Mahaulepu	90	5.51
Hanamaulu	200	3.42
Lihue (Weber)	200	4.65
Lihue (Grove Farm), e.	200	4.32
Lihue (Molokoa), e.	250	5.20
Lihue (Kukaua), e.	1,000	7.26
Kealia, e.	15	5.49
Kilauea (Plantation), ne	325	5.45
Halaula	250	5.50
Mana Pump	10	2.27
Waiawa	32	0.22
Eleele	150	1.88
Wahiawa Mt.	2,000	12.50
Wahiawa	250	2.43
McBryde	850	5.19
Lawai (Gov. Road)	450	6.30
Lawai Beach	5	3.81
Lawai, w	225	3.61
Lawai, e.	800	5.48
Koloa	100	4.95
Koloa (Kukuiula)	100	4.16
LANAI.		
Gay Residence	1,780	9.60
KAHOOLAWE.		
Kahoolawe	1,420	1.47
Delayed November reports		
Gay (Lanai)	1,780	3.33
Kula-Waiakoa (Maui)	2,700	1.59

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for November, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	23	17.81	12.99
Northern division	22	53	8.60	6.26
West-central division	26	25	3.16	5.38
Southern division	27	31	1.92	4.11
Means	100	132	7.87	7.19

The rainfall for November was, therefore, above the average for the whole island. The greatest rainfall, 65.06 inches, occurred at Moore Town, in the northeastern division, while, 0.22 inch fell at Lunatic Asylum in the southern division.

Comparative table of rainfall for December, 1904.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	28	6.85	10.61
Northern division	22	51	3.13	5.95
West-central division	26	19	3.41	3.52
Southern division	27	34	2.36	2.28
Means	100	132	3.94	5.59

The rainfall for December was, therefore, very much below the average for the whole island. The greatest fall, 19.12 inches, occurred at Moore Town, in the northeastern division, while no rain was recorded at Amity Hall in the southern division.

Chart I. Tracks of Centers of High Areas. December, 1904.

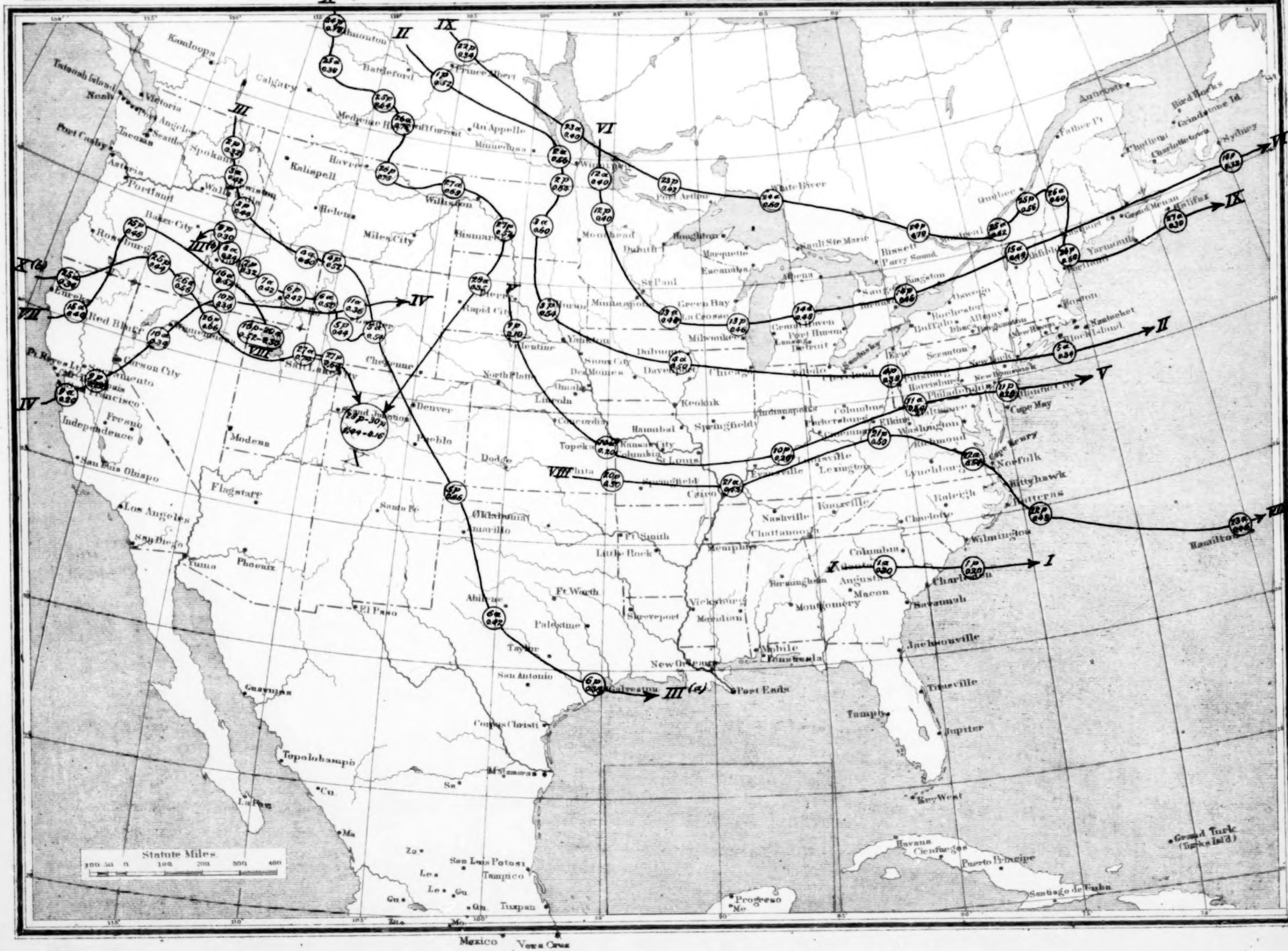
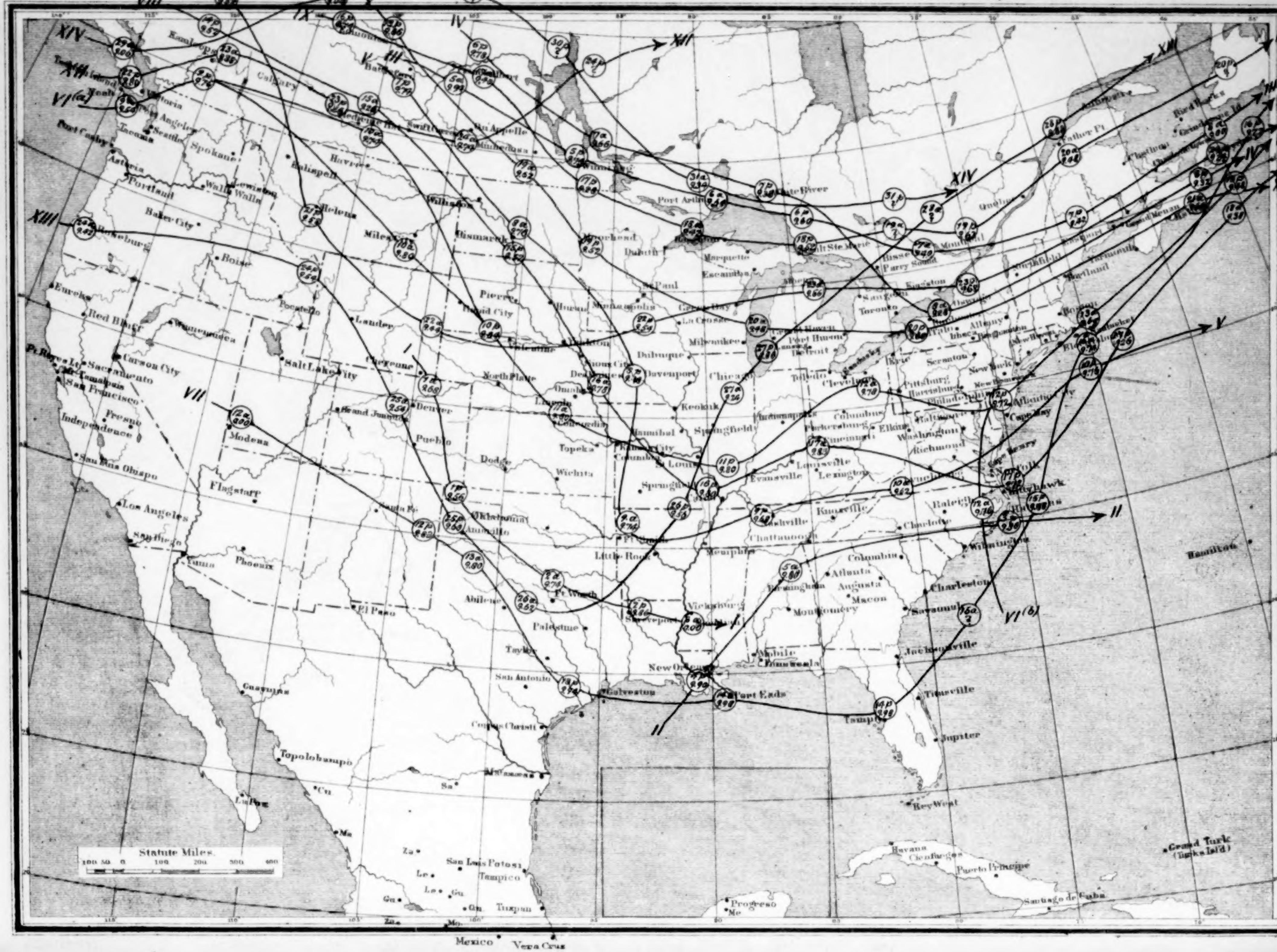


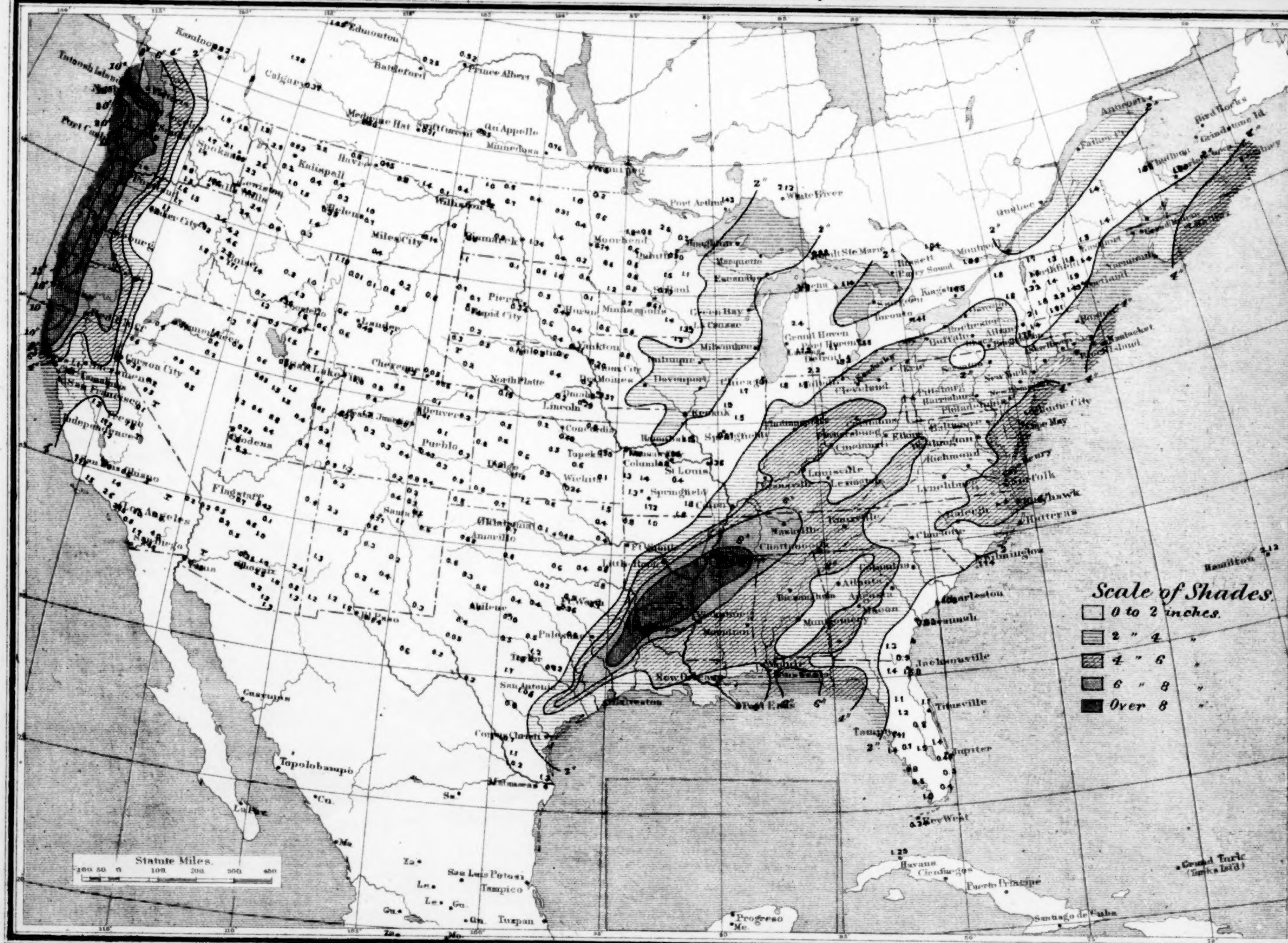
Chart II. Tracks of Centers of Low Areas. December, 1904.



Barkerville

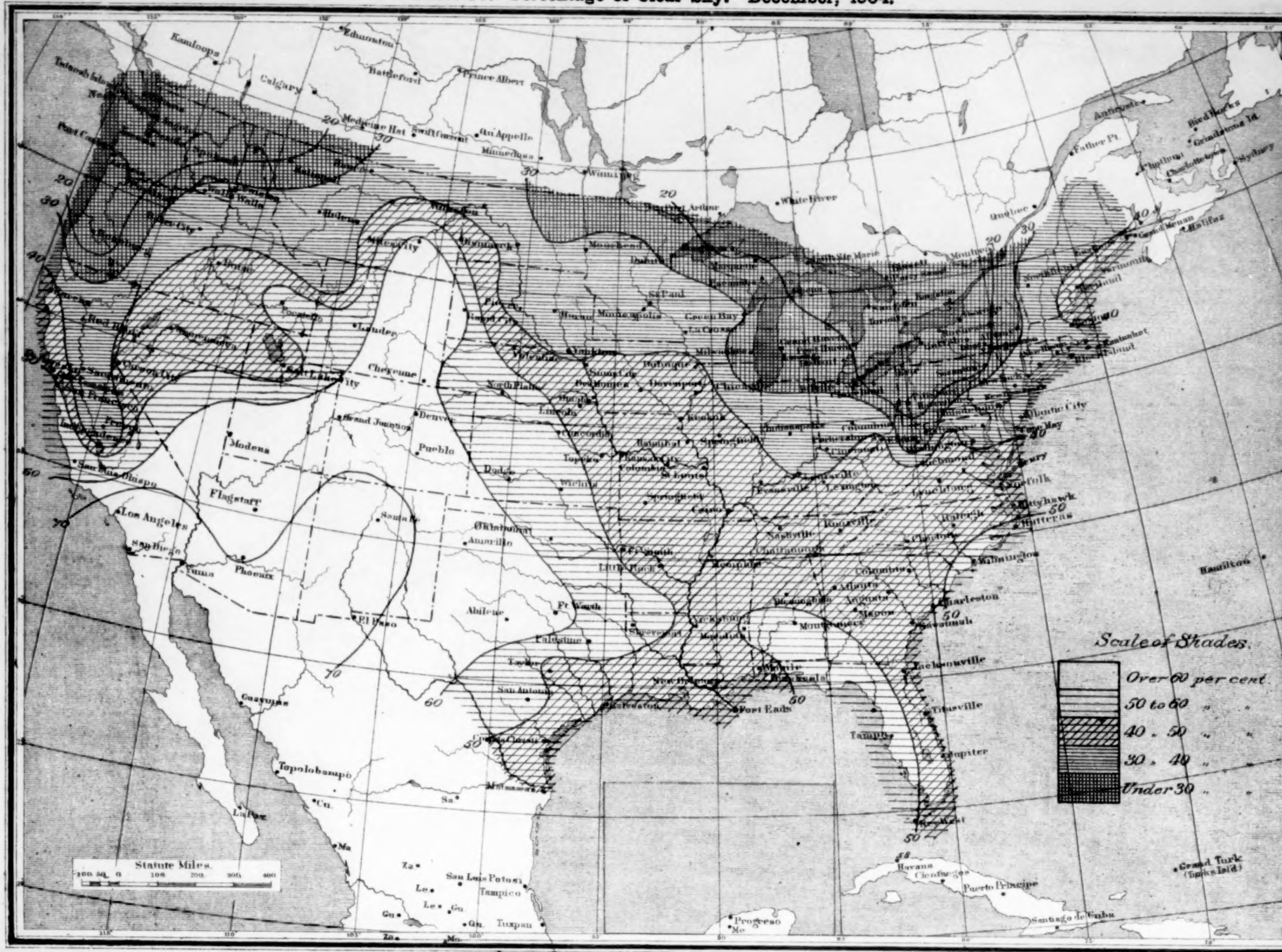
Chart III. Total Precipitation. December, 1904.

Chart III. Total Precipitation. December, 1904.



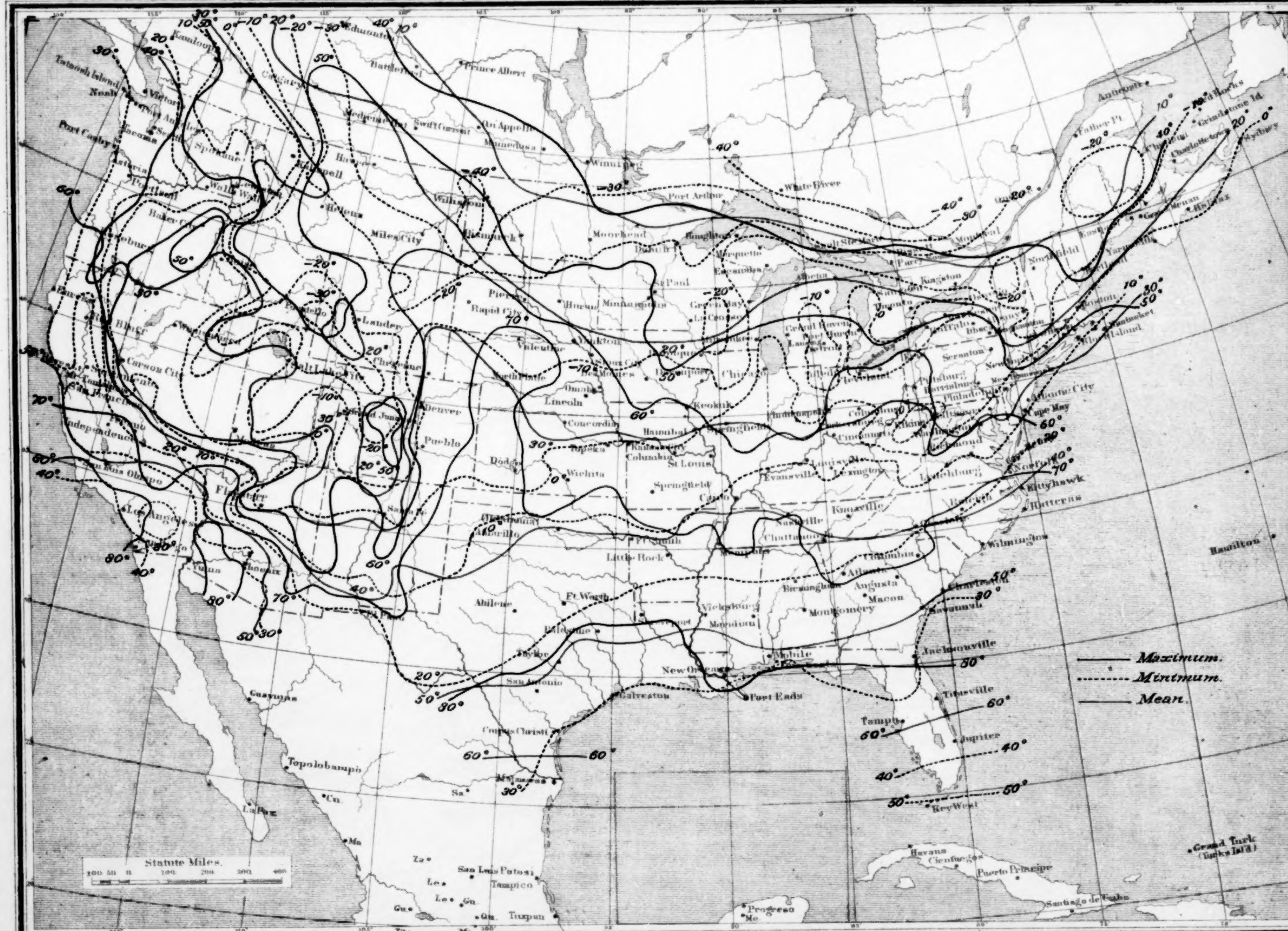
• Barkerville

Chart IV. Percentage of Clear Sky. December, 1904.



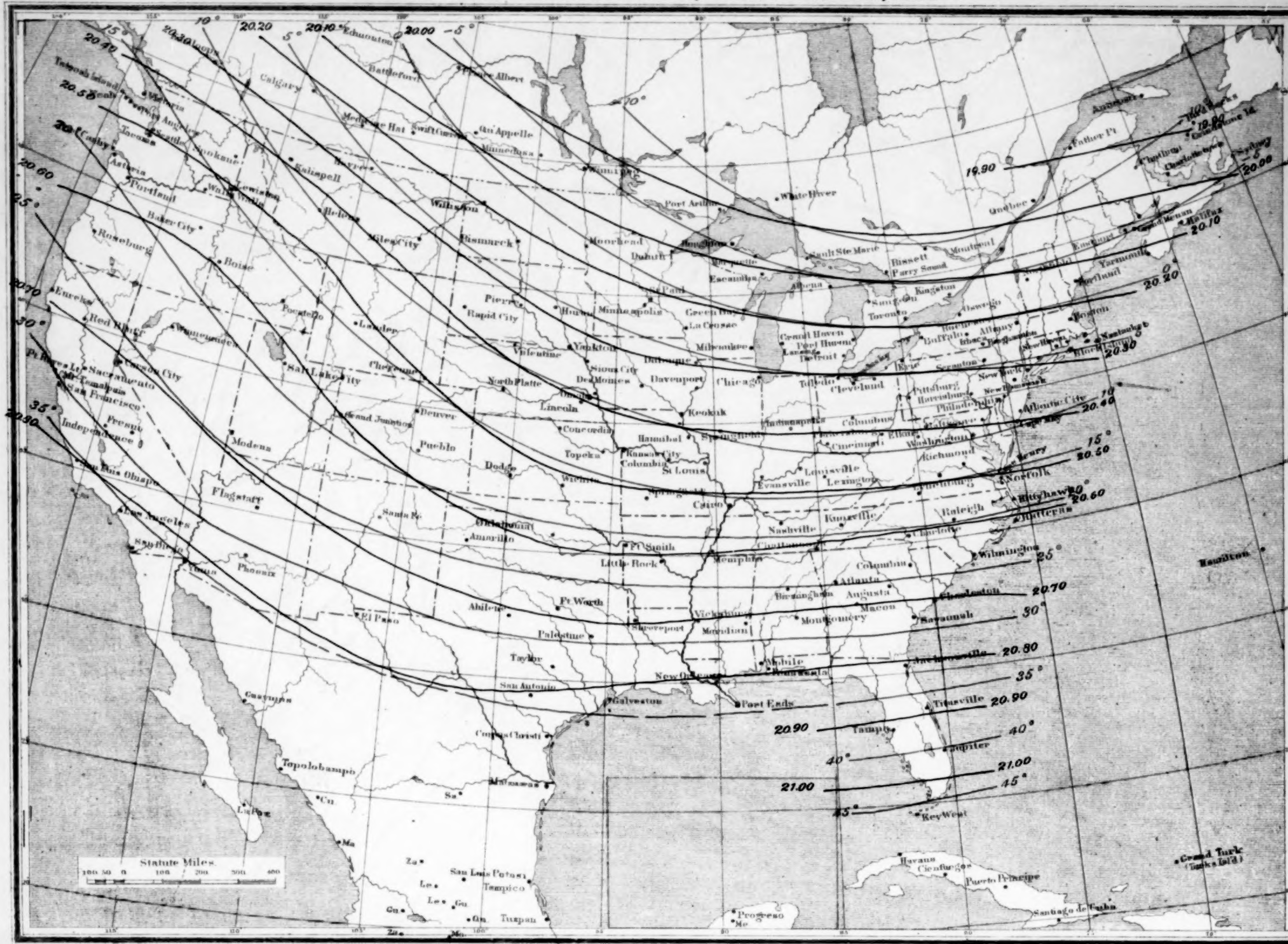
• Barkerville **Chart V. Surface Temperatures; Maximum, Minimum, and Mean. December, 1904.**

Chart V. Surface Temperatures; Maximum, Minimum, and Mean. December, 1904.



• Barkerville

Chart VI. Isobars and Isotherms at 10,000 feet. December, 1904.



• Barkerville

Chart VII. Isobars and Isotherms at 3500 feet. December, 1904.

XXXII—145. **Chart VII. Isobars and Isotherms at 3500 feet. December, 1904.**

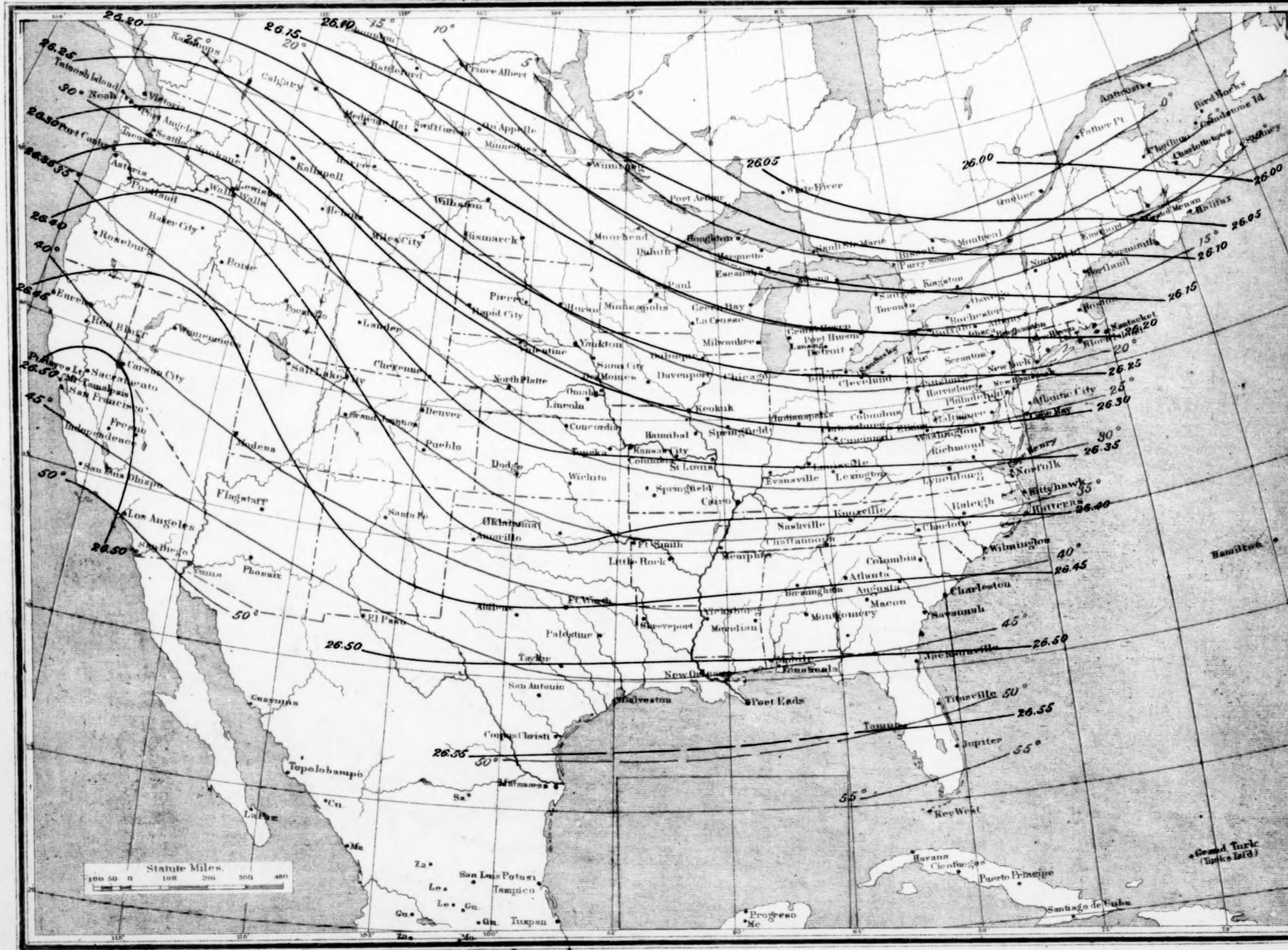


Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. December, 1904.

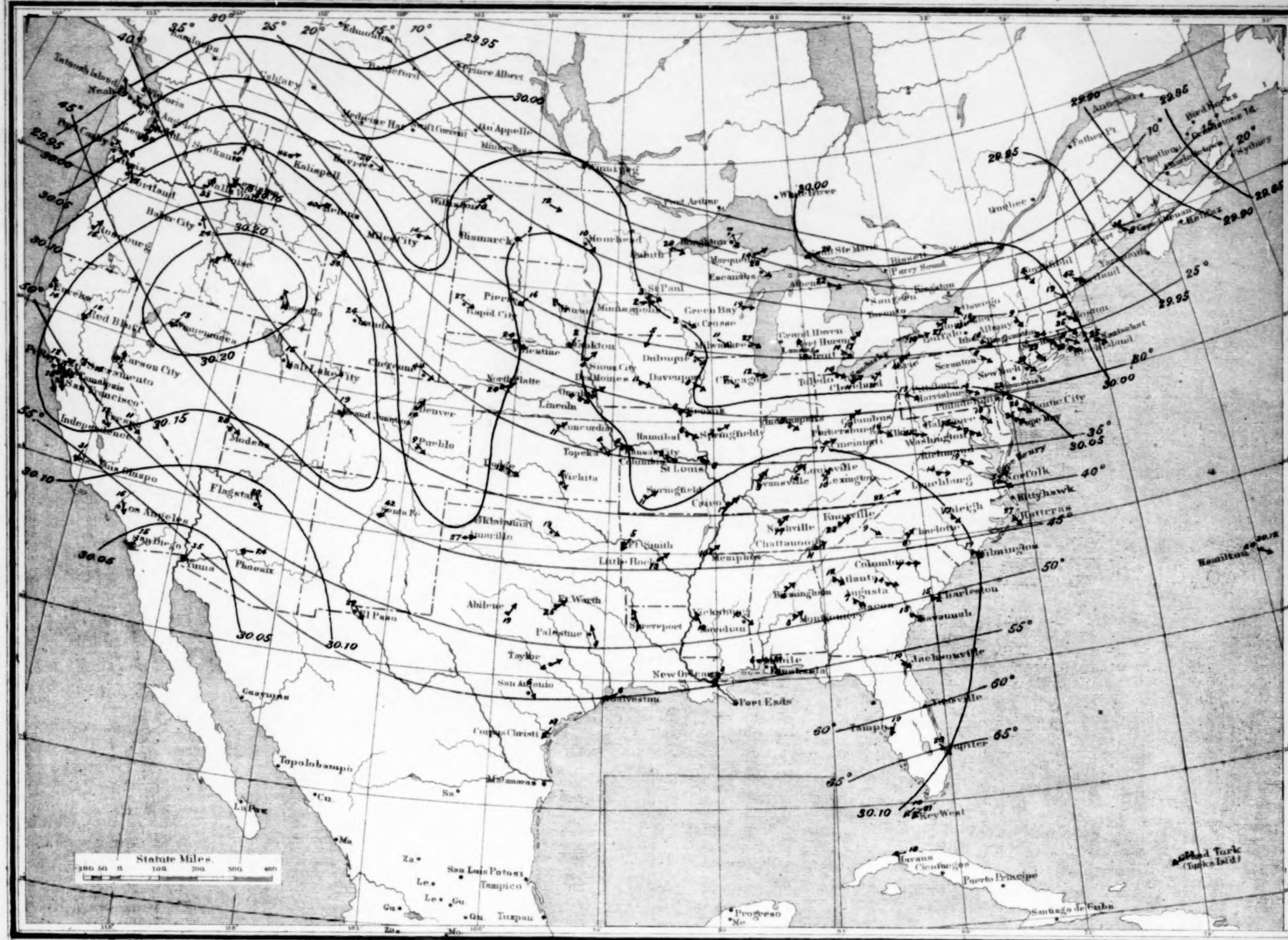


Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. December, 1904.

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds, December, 1904.

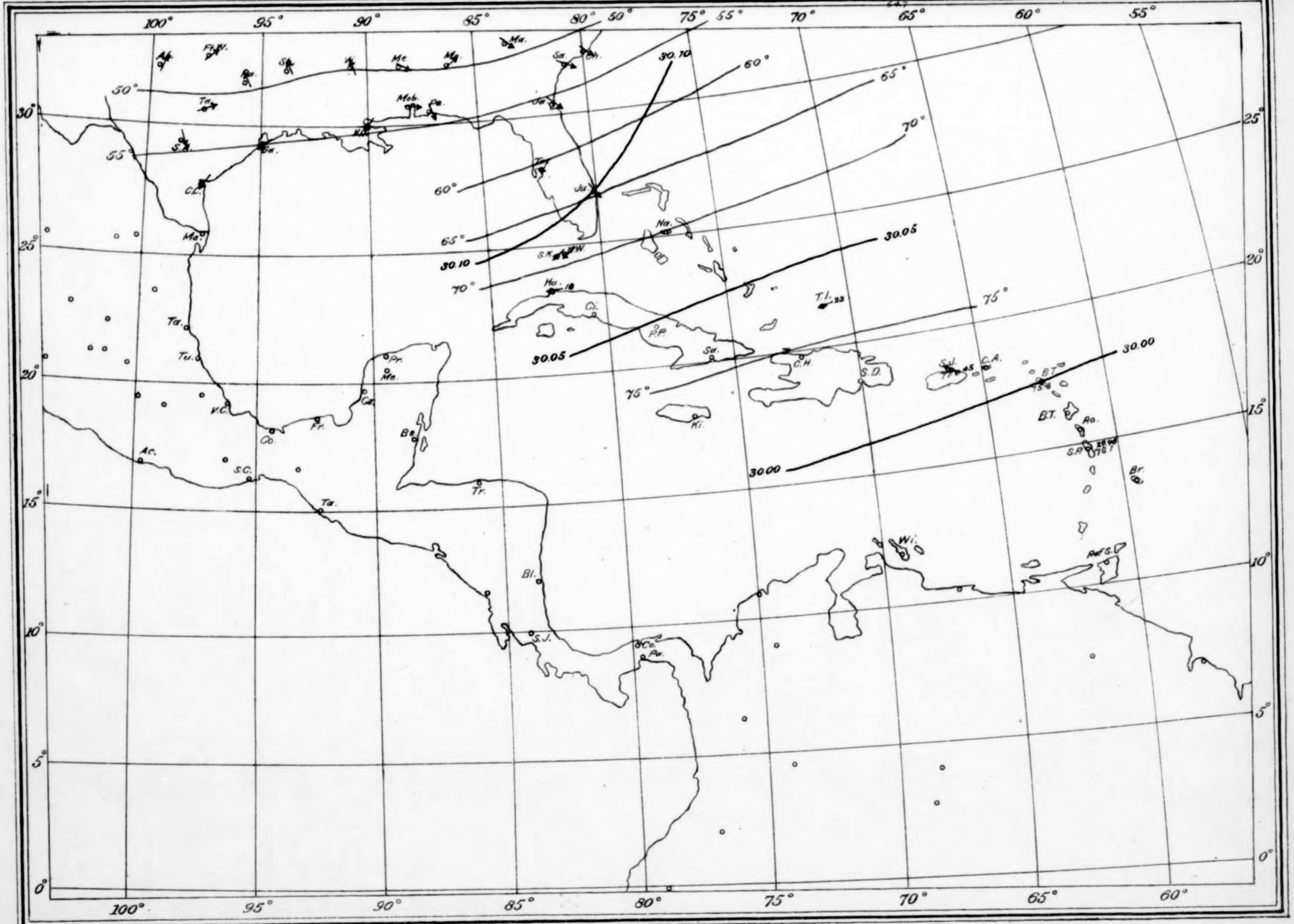


Chart X. Hydrographs for Seven Principal Rivers of the United States. December, 1904.

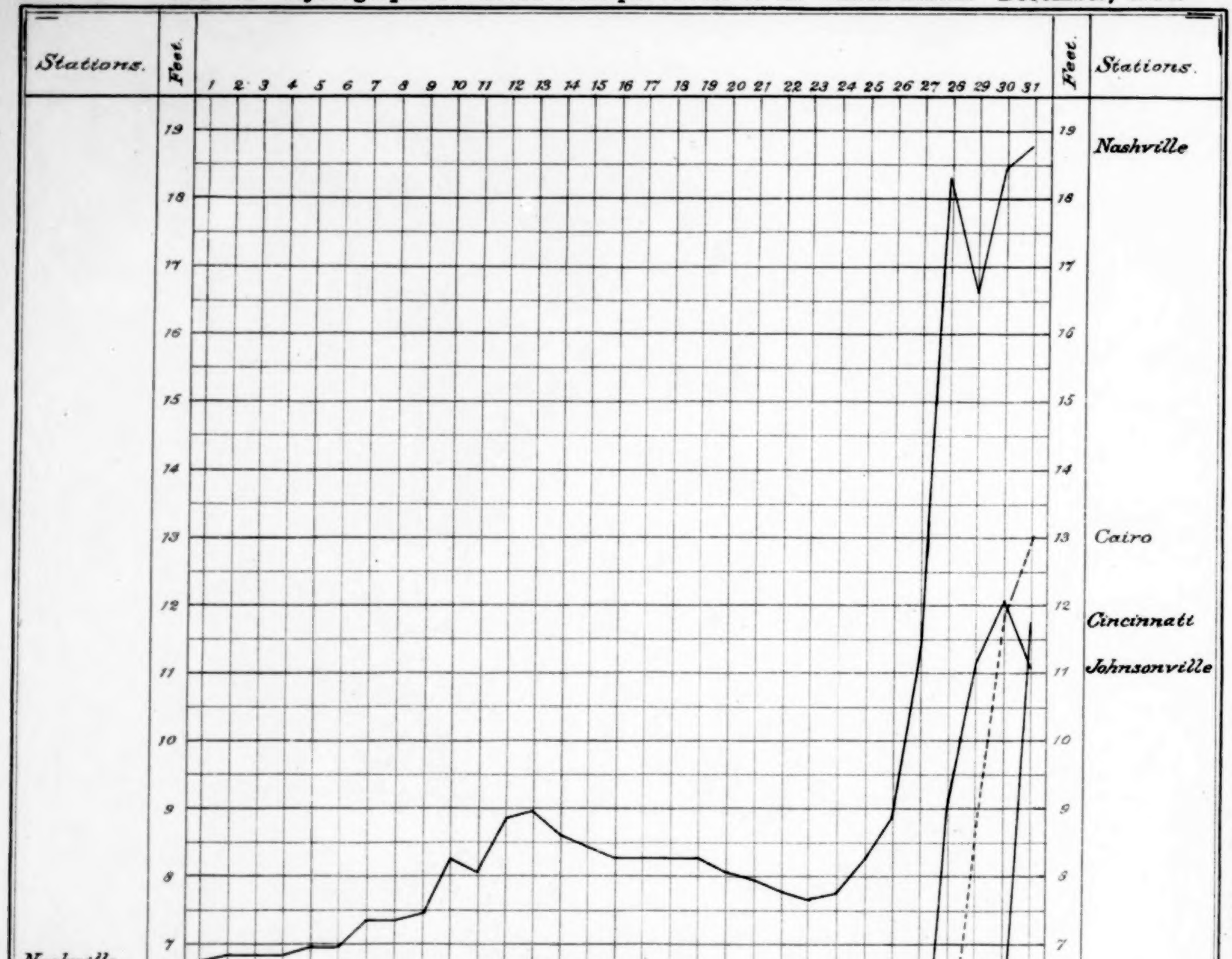


Chart XI. Total Snowfall for December, 1904.

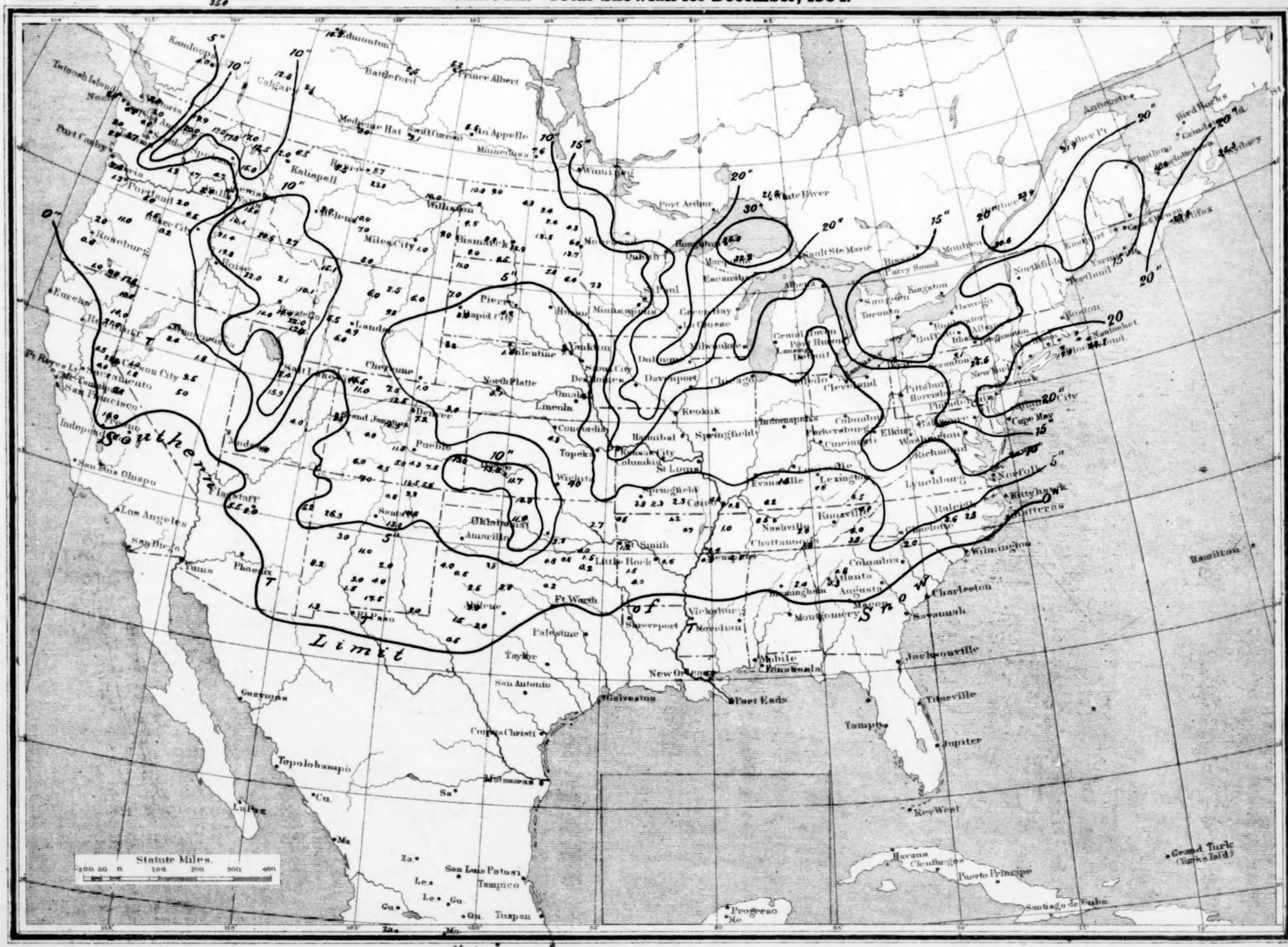
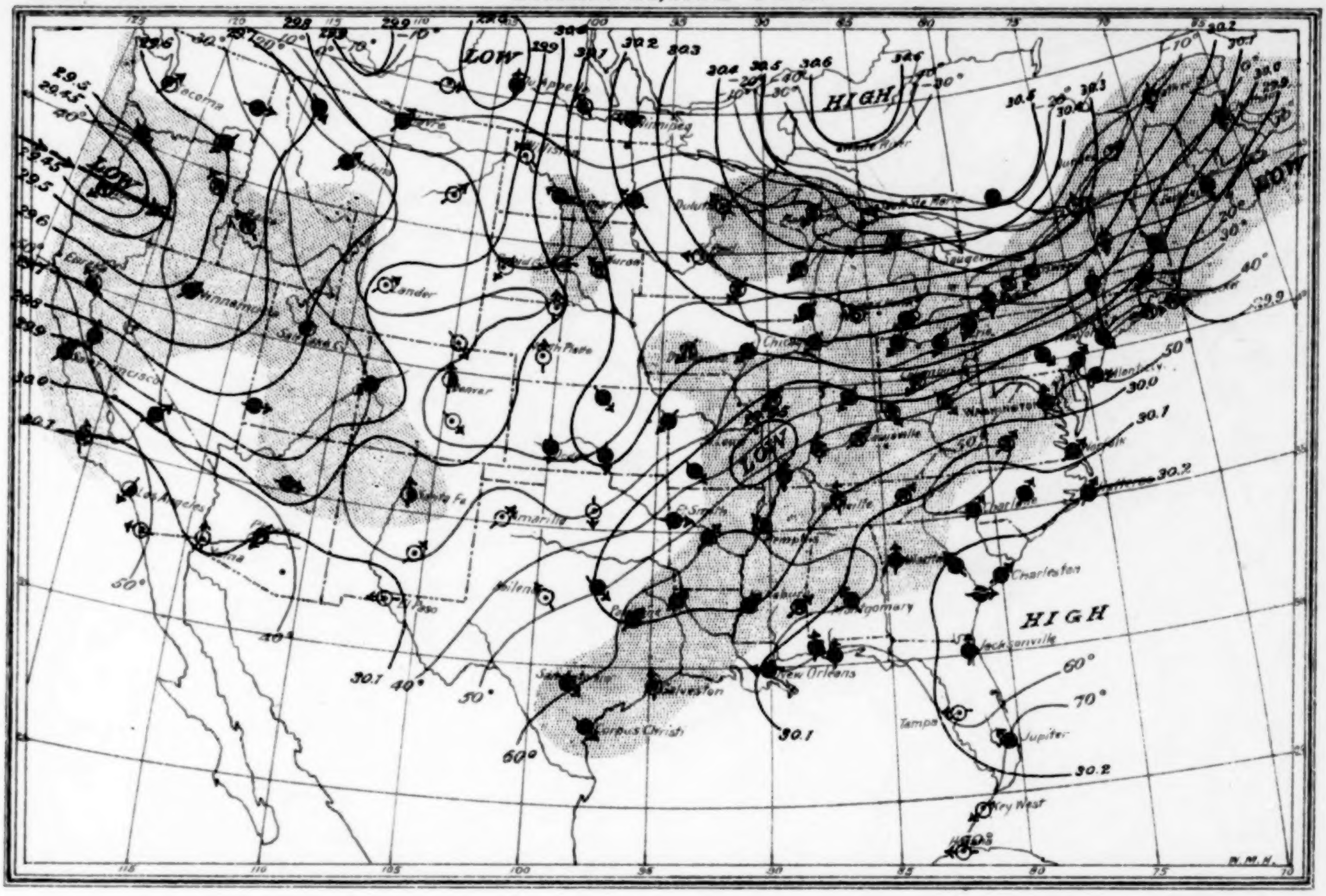


Chart XII. Depth of Snow on Ground December 31, 1904.

Chart XIII. Daily Weather Maps.

December 24, 1904. 8 a. m.



December 25, 1904. 8 a. m.

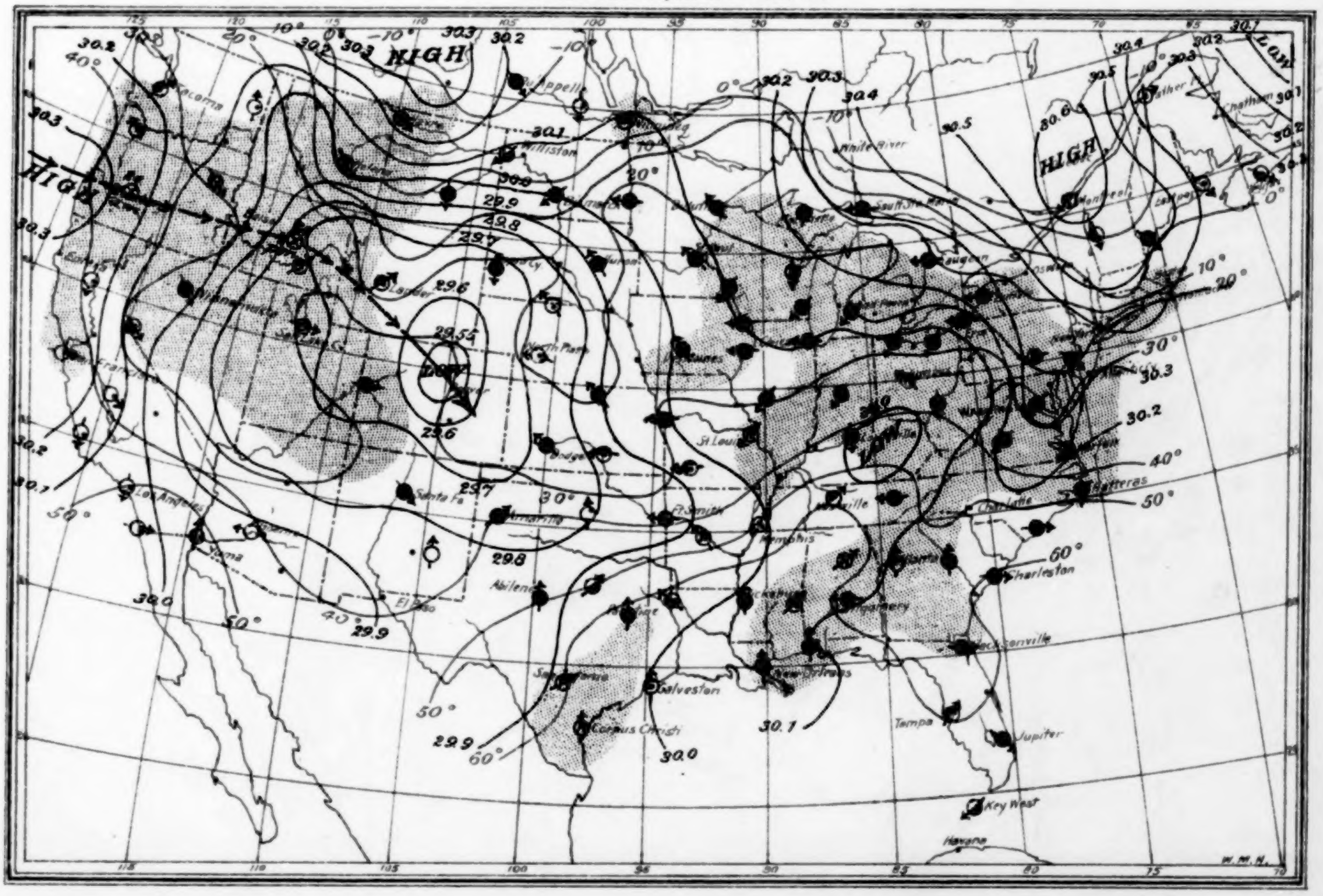
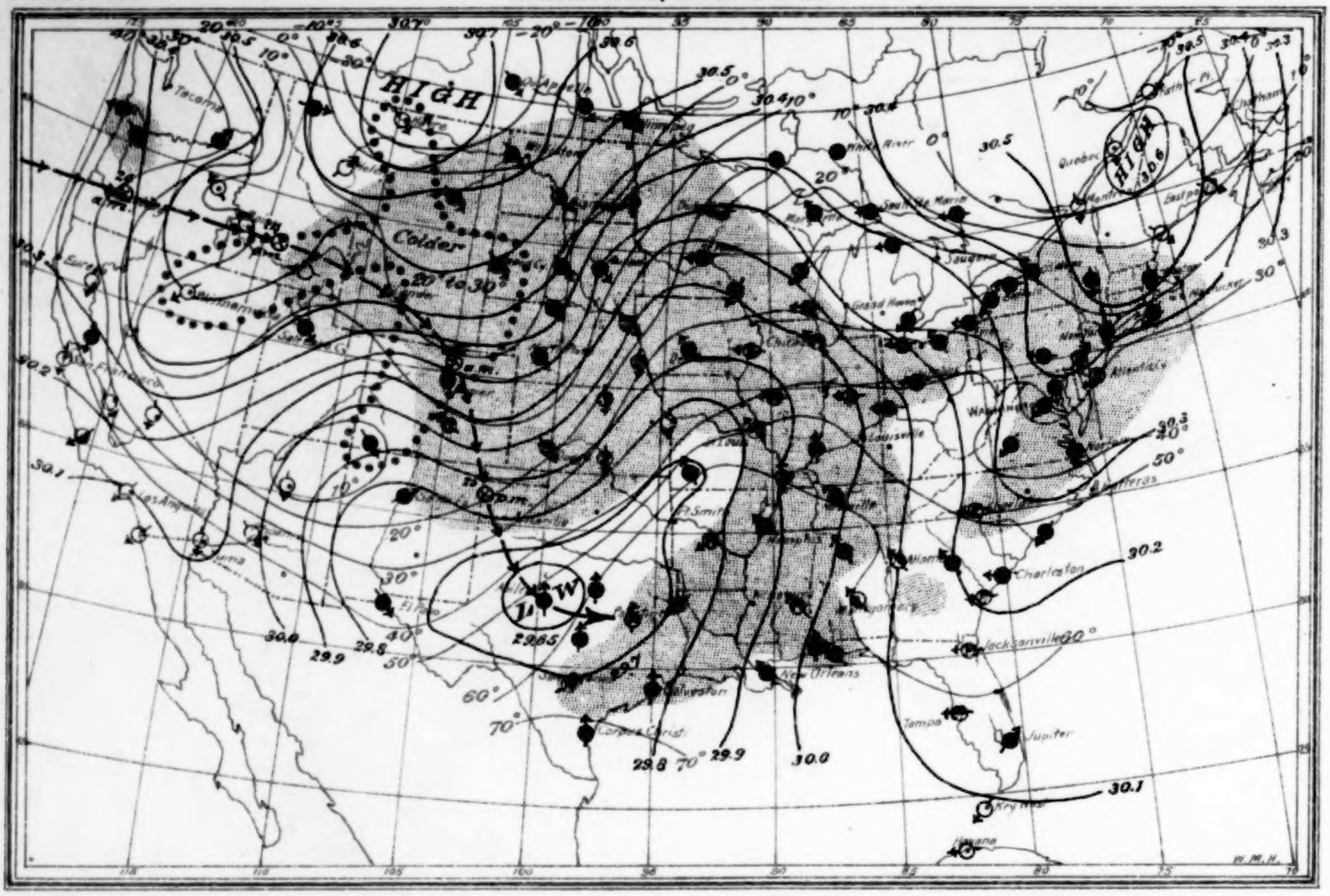


Chart XIV. Daily Weather Maps.

December 26, 1904. 8 a. m.



December 27, 1904. 8 a. m.

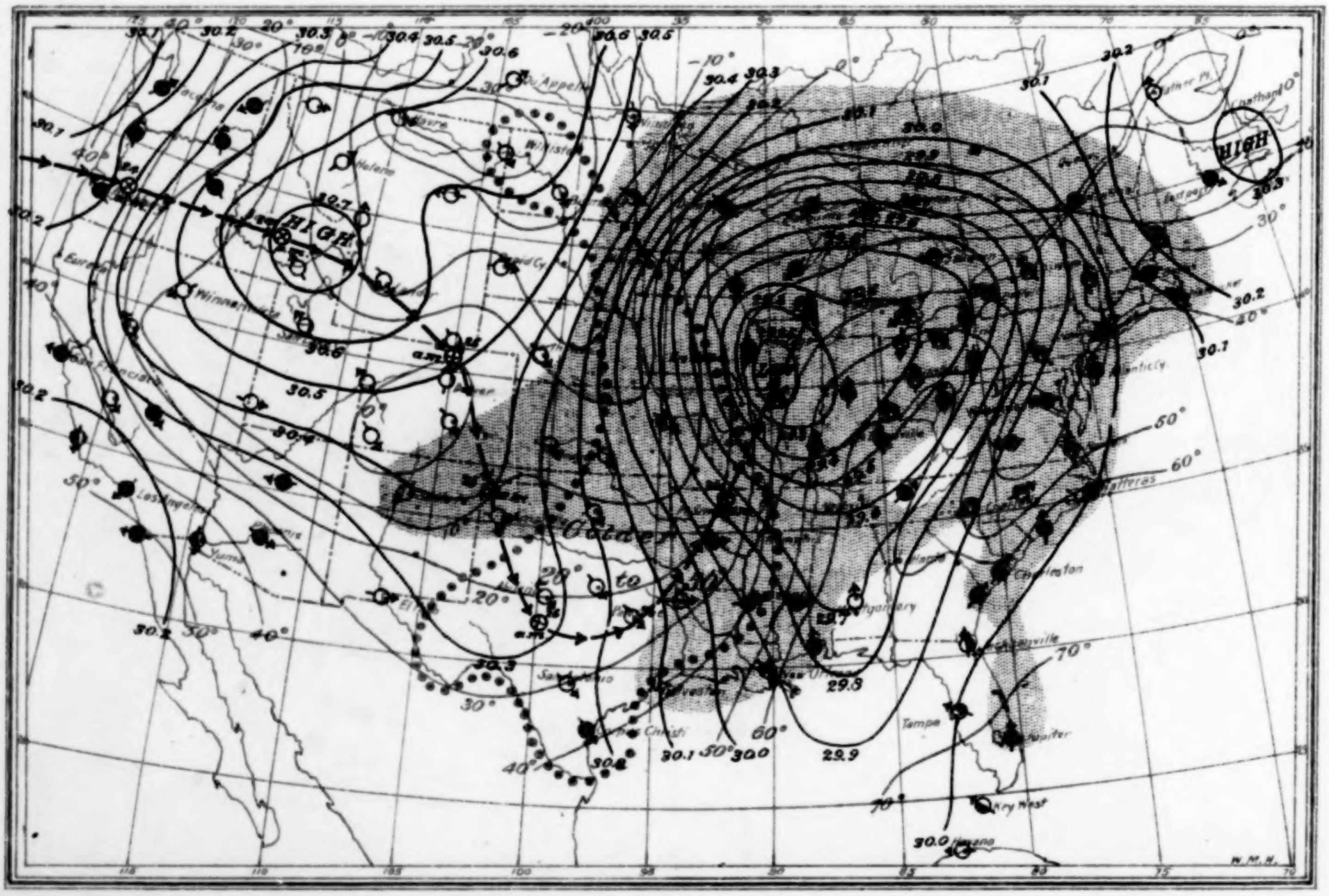
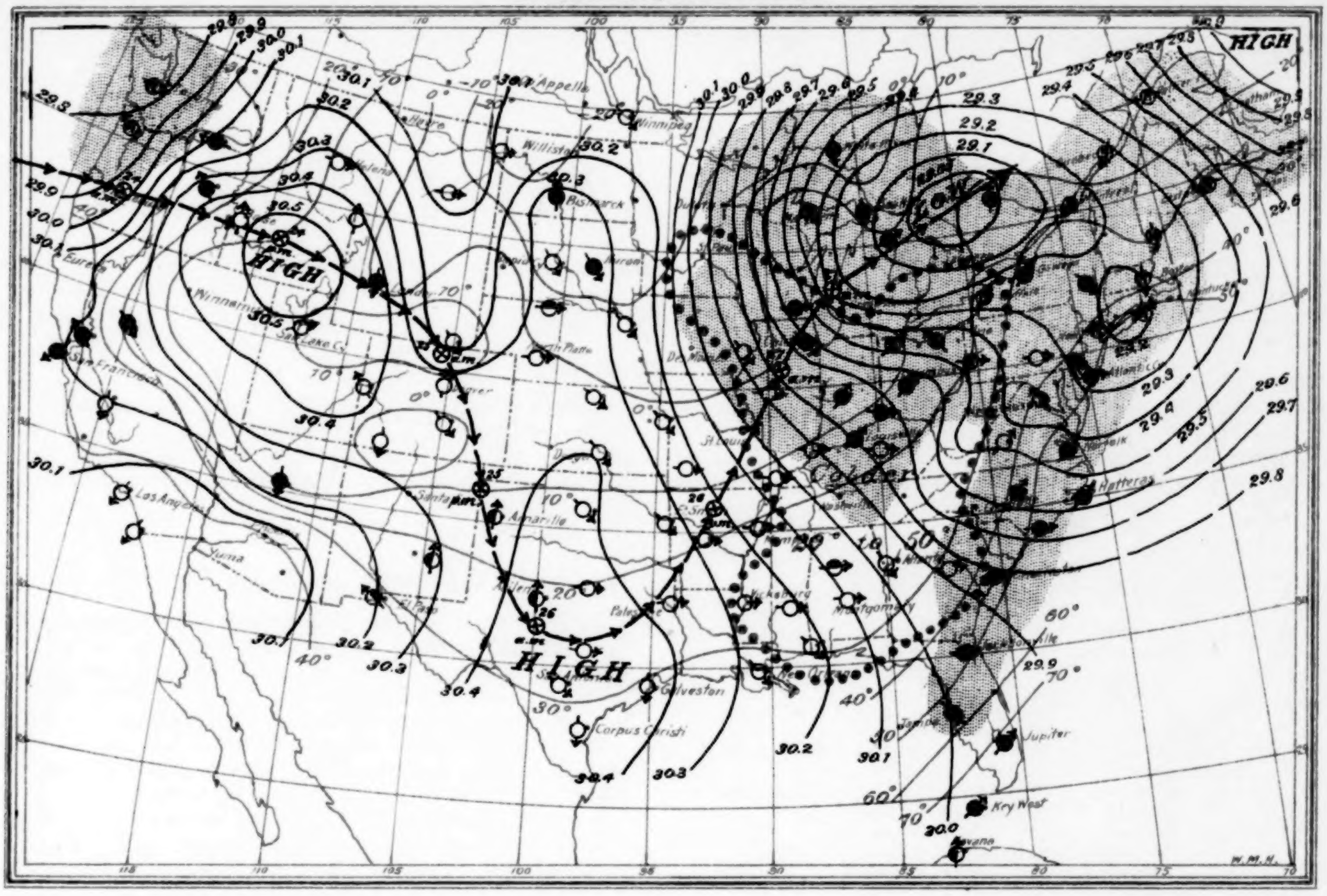


Chart XV. Daily Weather Maps.

December 28, 1904. 8 a. m.



December 29, 1904. 8 a. m.